PSYCHOLOGY

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PSYCHOLOGY

(*For Reviews*)

BY

J. BAAR, M.A.

INTRODUCTION BY

C. J. WARDEN, PH.D.

COLUMBIA UNIVERSITY, NEW YORK CITY

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PREFACE

The author claims no originality for the subject matter in this book. In fact, the principal value of the text is derived from the fact that the writer has drawn so unblushingly upon textbooks and other sources. Where a distinct viewpoint is presented or where considerable material has been taken from a single source, the name of the author is given in parentheses. More general subject matter is based upon the books appearing in the bibliography on pages 119 and 120. This book is especially designed as a companion volume to those references in the bibliography which are marked with a star (*).

The writer is indebted to Professor R. S. Woodworth, Professor C. J. Warden of Columbia University, and to Professor P. D. Stout of New York University, for many valuable suggestions. It is likewise a pleasure to acknowledge the cordial assistance of Mrs. Bernice E. Barrows and Mrs. E. Tunnell, who are in charge of the Psychology Library at Columbia University.

J. Baar.

Morningside Heights,
New York City,
December, 1928.

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INTRODUCTION

BY

C. J. WARDEN, Ph.D.

Columbia University, New York City

The fact that there are so many current schools of psychology representing divergent general viewpoints and methods of approach places a heavy task upon both the instructor and the beginning student. This is especially true now that the text book method has been replaced to a large extent by topical discussions without due regard to their relationship in a general scheme. The organization of lecture and reading material is seldom sufficiently stressed. The technical terminology of the science is much larger than one might suppose. Clear cut statements of the views of the leaders of the more important schools of thought are not easy for the elementary student to select from his reading and properly collate. In fact, the need for pedagogically sound guidance of some sort is generally recognized.

The present work is an attempt to meet this need. It aims to present in a clear and logical manner the treatment of the more important schools on the topics of major interest in current class room discussion. It is, in fact, a synopsis of psychology as we find it presented in the leading textbooks of the day. Not only is the material arranged under carefully selected topics, but the book is also very well indexed making it possible

to locate each item with ease and convenience. The book should serve a useful purpose in guiding the beginning student in his first approach to psychology. Moreover, it ought to prove equally valuable as a basis for such review work as is necessary in preparing for examinations. The exercises at the end of each chapter should be helpful in stimulating thought and in awakening a deeper interest in psychological problems.

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PSYCHOLOGY

(For Reviews)

PSYCHOLOGY

CHAPTER I

DEFINITIONS, METHODS, AND FIELDS OF PSYCHOLOGY

INTROSPECTIVE—BEHAVIORISTIC (WOODWORTH)

Definition. Psychology is the science of mental life. Mental life consists of those activities of the living individual which are conscious or near-conscious.

Methods

Observation. 1. *Subjective* (introspection)—observation of our own mental states.

Mental process—retrospective observation of what took place in our mind during a mental process such as reasoning.

Mental product—immediate observation of some subjective fact such as a positive after-image.

2. *Objective*—observation of

Objective process—such as maze-learning.

Objective product—such as a test score.

Experimentation. Observation under systematically controlled conditions.

1. *Introspection.*

2. *Objective observation*—measures.
   Time required to complete a task.
   Quantity accomplished in a given time.
   Excellence of the work done.
   Difficulty of the task assigned.

Comparative Method. 1. Establishes averages of likenesses and differences in individuals and classes.

2. Establishes correlations—degrees of relationship—between various traits.

Genetic Method. Traces the mental development of the individual or of the race.

Pathological Method. 1. Traces the disturbance or decay of mental life.

2. Studies the abnormal forms and behavior of mental life.

INTROSPECTIVE PSYCHOLOGY IS THE SCIENCE OF CONSCIOUSNESS

STRUCTURALISM (TITCHENER)

Definition. Psychology is the science of mental states or mental contents.

Mind is the sum total of mental states occurring in the life-time of an individual. These mental states are dependent upon the nervous system and are ever changing. Consciousness is the sum total of mental contents at any given moment.

Method. To analyze by introspection a state of consciousness into its three classes of elementary contents —sensations, images, and feelings—and then show how these elements combine to form the more complex contents of experience. Experimentation is used as an aid to introspection.

Sensations—constituted of four attributes; quality, intensity, clearness, and duration—are the elements of perception.

Images are the elements of ideas, memory, and imagination.

Feelings—constituted of three attributes; quality, intensity, and duration—are the elements of emotion.

FUNCTIONALISM (ANGELL)

Definition. Psychology is the science of mental processes or functions:

Methods. Introspection and Experimentation.

Treats Mind as constantly changing processes which adjust the entire psycho-physical organism to varying environmental conditions. Each process is described in its wholeness and is not analyzed into its constituent parts.

Consciousness is a control phenomenon and the various forms of consciousness are phases of the general process of adjustment.

BEHAVIORISTIC (WATSON)

Definition. Psychology is the science of behavior.

Behavioristic psychology attempts to formulate through systematic observation and experimentation, the generalizations, laws, and principles which underlie man's behavior. It seeks to analyze the complex factors involved in the development of human behavior from infancy to old age, so that the psychologist may:

1. By observing the response, infer the probable stimulus or situation that called forth the act.

2. Given the situation, predict the probable response to it.

A stimulus is any force or agent which acts upon the individual and arouses a response. It may be external to the body, e.g., light, sound, heat, etc., or internal, e.g., hunger, thirst, etc.

A response is the movement of muscles or the secretion of glands due to stimulation. The behaviorist classifies responses into:

1. Explicit habit responses—playing tennis.
2. Implicit habit responses—language habits, the system of conditioned reflexes.
3. Explicit hereditary responses—grasping, fear.
4. Implicit hereditary responses—ductless gland secretions.

Methods

Observation. 1. Without instrumental control.
2. With instrumental control.

Method of Conditioned Reflexes.
1. In obtaining conditioned gland secretions.
2. In obtaining conditioned motor reflexes.

Method of Verbal Report.

Methods of Testing.

PSYCHO-ANALYSIS (FREUD)

Definition. Psycho-analysis is a method of treating functional nervous disorders.

Unpleasant ideas and elementary desires which conflict with social customs are repressed into the Unconscious. There they remain active manifesting themselves in everyday life in dreams, errors of speech, etc., or causing various functional diseases.

A functional disease involves a disorder in the activity of the individual without any apparent physiological cause.

Method. By free association to bring into consciousness from the Unconscious, repressed complexes which are usually of infantile and sexual origin. The therapeutic value of psycho-analysis lies in the fact that when the origin and nature of a patient's morbid fears and worries are brought into consciousness, the abnormal symptoms disappear.

A complex is an organized group of ideas which has been repressed into the Unconscious, together with its emotional tone. These ideas cannot be recalled but still continue greatly to influence the behavior of the individual.

Repression is the forcing from consciousness into the Unconsciousness any unpleasant ideas or mental conflicts.

The Censor is the repressing force which prevents unconscious ideas from coming into consciousness again.

A conflict is the struggle between one's elementary desires and opposing social customs.

GESTALT (CONFIGURATION, FIGURE, STRUCTURE, FORM, PATTERN)

Definition. Psychology is the science of the conscious and behavior configurations of immediate experience.

A configuration is a totality which cannot be made up by adding together the elements that constitute it nor can the whole be reduced to the elements that make it up. The simplest observable configuration in perception is that formed by figure and ground in mutual rela-

Koffka says that a configuration is
consistence of phenomena in which each

tion with each other. The figure is the dominant part of a perception and has a clear, well-defined pattern. The background sets the figure off and is more or less homogeneous.

Physiologically, a configuration consists of the afferent, central, and efferent parts of the nervous system functioning as a unit. Behavioristically, a configurational response is a reaction pattern in which each act attains meaning and is what it is by virtue of its parts in the total situation confronting the organism.

Each configuration possesses four essential characteristics:

1. The unity of a configuration is inherent in the figure itself and cannot be created by any outside activity such as attention or association. Introspective psychology considers mental units as discrete associated aggregates.

2. The elements of a Gestalt are not independent entities possessing characteristics of their own but derive their quality from the whole in which they belong. All the elements of a form mutually influence each other.

3. The total figure possesses specific properties as a whole which are lost in analysis.

4. All configurations are meaningful unities since all parts are interrelated. According to the introspective view, a mental unit consists of elements which have no essential relation to each other.

Method.

The Gestalt psychology is opposed to:

1. The introspective method of analyzing mental

units into sensations since these elements are meaningless when divorced from their original pattern.

2. The behavioristic method of analyzing behavior into part-activities since it leaves unexplained how these meaningless units become linked into meaningful behavior.

The Gestalt psychology employs the method of functional description. The stimulus is only one factor of a response and the organism itself is another. It is a functional method in that the organism is not considered as a system of conducting pathways but as a dynamic, constantly changing unit. The behavior of an organism changes the environment and its subsequent behavior is a response to the new situation which the organism itself has in part created. Response is not a single activity following stimulation but is an interrelation between stimulus and response.

SELF-PSYCHOLOGY (CALKINS)

Definition. Psychology is the science of the self in relation to, or conscious of, its environment.

The Self possesses four fundamental characteristics: relatively persistent, complex, unique, and is related to other selves and external objects.

Method. Introspection.

PURPOSIVE PSYCHOLOGY (McDOUGALL)

Definition. Psychology is the science of purposive behavior.

Method. Observation of: **1.** One's own experience.

2. The conditions or occasions of experience. 3. The expression of one's experience.

DIFFICULTIES AND LIMITATIONS OF INTROSPECTION

1. Introspection being itself a mental process necessarily interferes with and alters the mental process being introspected.

2. Conscious data are usually complex and shifting, making accurate observation difficult.

3. There is no unanimity among introspectionists, their results often being contradictory.

4. Since each one can introspect only his own mind, the validity of the subjective observation cannot be tested.

5. It is descriptive and not explanatory, giving only data but not a system of psychology.

6. Introspection by itself is not complete requiring for supplementation:

(a) Collaboration of other introspectionists.

(b) Observation of behavior.

(c) Experimentation.

7. Introspection cannot be used in many branches of psychology as in animal, genetic, social, abnormal.

The advantage of introspection is that it yields data not accessible by any other method.

FIELDS OF PSYCHOLOGY

1. Genetic or Child. Studies the mental development of children from birth to maturity. Children are fruitful subjects for study since their behavior is relatively simple, their motives little concealed, and the

beginning and development of many habits and traits can be traced.

2. Animal. Studies animal behavior. The simple behavior of the animal reveals principles that explain human behavior. This field is best controlled since the life of the animals can be regulated, their short lives make possible the study of whole life cycles, and they can be operated upon.

3. Abnormal. Studies people whose behavior deviates considerably from the norm.

4. Social. Studies individuals in their relation to other people.

5. Educational. Studies the original nature of man and particularly the laws of how that nature is modified.

6. Differential. Studies the amount, kind, and significance of differences between individuals tested under the same conditions.

7. Applied. Applies the principles of psychology to the practical problems of life especially in medicine, law and business.

8. Race. Studies the mental characteristics of races in order to determine their similarity and differences.

9. Physiological. Studies the form and function of the bodily organs including the nervous system, and the relation of these to behavior.

General psychology studies the principles that hold in these various branches.

QUESTIONS

1. What are the most important methods used in attacking psychological problems?

2. Is the method of verbal report absolutely distinct from that of introspection?

3. What are the difficulties of introspection? Why do psychologists continue to use that method in spite of its limitations?

4. Which definition of psychology is stated in strictly objective terms? Are the methods of that school of psychology consistent with its definition?

5. Discuss some of the problems studied in the various fields of psychology.

6. What special difficulties are there in acquiring facts in psychology that are not present in such sciences as physics or chemistry?

7. Formulate a psychological problem and outline the methods that you could use in solving that problem.

8. How can the study of abnormal behavior aid in understanding the normal mind?

9. Define: stimulus, response, correlation, introspection, complex, configuration.

10. *Mark the following true or false:*

(a) Since animals cannot give an introspective report, it is not possible to determine whether they distinguish between different colors.

(b) Behaviorism is chiefly concerned with the study of consciousness.

(c) Objective data are more easily verified than subjective data.

(d) Psychologists are primarily interested in moral judgments on human behavior.

(e) Psychology studies only human behavior.

(f) General psychology studies how people differ.

CHAPTER II

RECEPTORS, THEIR STIMULATION, AND SENSATION

RECEPTORS—CLASSIFICATION (PERRIN AND KLEIN)

I. Somatic

Exteroceptors—external receptors located on the surface of the body and receive stimuli from a distance or through contact.

Distance receptors—organs of (a) Vision. (b) Audition. (c) Smell (also an interoceptor).

Contact receptors—cutaneous sense organs of (a) Touch. (b) Heat. (c) Cold. (d) Pain.

Proprioceptors—are innervated by stimuli furnished by the organism itself.

1. Organs of position and equilibrium.

2. Organs of kinesthetic functions in muscles, tendons, and joints.

II. Visceral

Interoceptors—located within the body.

Receptors of the digestive system—organs of (a) Smell. (b) Taste. (c) Hunger. (d) Thirst. (e) Nausea.

Receptors of the Circulatory, respiratory, and reproductive systems.

RECEPTORS—STIMULATION AND SENSATION

I. Vision

Stimuli. Light waves between 390 (red) and 760 (violet) millionths of a millimeter in length.

Receptors. 1. The actual receptors are:

Cones of the retina sensitive to both brightness and color. The cones are active in the light-adapted eye.

Rods of the retina sensitive only to brightness. The rods are active in the dark-adapted eye.

2. The **retina** has three important regions:

Yellow spot—a small region at the center of the retina having a yellowish tinge. In the middle of the yellow spot is a slight depression called the **fovea,** which is the region of clearest vision. In the fovea there are only cones.

Blind spot—the place where the optic nerve issues from the eyeball. Here there are no rods and no cones, hence no vision.

Periphery—the outer rim of the retina. Contains only rods. In this region vision is indistinct and colors cannot be distinguished.

How We See

A ray of light passes through the cornea, the aqueous humor, the pupil and into the lens. Then it passes through the vitreous humor and the nine layers of the retina to stimulate the rods and cones. Impulses are then sent to the brain by means of the optic nerve. The optic nerve passes from the eyeball, through the blind spot, into the occipital lobe of the cerebral cortex.

the nerve from the right eye going to the left hemisphere and the nerve from the left eye going to the right hemisphere.

In order to aid vision the eye makes two main adjustments:

Accommodation—the adjustment of the curvature of the lens by the contraction of the ciliary muscles, so that clear images are produced on the retina.

Eye Movements—adjust the eyes so that they are directed toward the object of vision.

Conjugate—movement of the eyes horizontally, vertically, and obliquely.

Convergent—movement of the eyes toward each other.

What We See

1. Qualities of visual sensation.

Color or Hue—the chromatic series from red to violet. Depends upon the length of the light wave. There are four primary colors: red, green, yellow, and blue. All other colors are formed from mixtures of these.

Brightness or Shade—the achromatic series from white to black through all the grays. Depends upon the amplitude of the light wave. The intensity of the visual sensation is determined by the amount of white or black mixed with a color.

Saturation or Tint—the series from deep to pale of a certain color. Depends upon the amount of different wave lengths mixed with a given color.

2. Complementary colors—are those that when mixed in suitable proportions produce gray. They are red and green, yellow and blue, white and black.

3. Laws of Color Mixture.

(a) For every color there is a complementary color and when both are mixed in proper proportion they produce a gray.

(b) The mixture of non-complementary colors produces a color which is between these two colors.

(c) If the mixture of colors produces a certain sensation and the mixture of other colors produces the same sensation, then a mixture of these mixtures will produce that sensation.

4. Purkinje Phenomenon.

In the dark-adapted eye the point of maximum brightness shifts from the yellow of the spectrum to the green. The red end of the spectrum darkens while the blue end appears brighter.

5. After-Images.

Positive—is a persistence of the sensation after the stimulus has ceased to act. This is due to the inertia of the retinal processes.

Negative (successive contrast)—is an after-sensation which is the complementary color of the original sensation.

6. Simultaneous Contrast—is the induction in adjacent colors the complement of a color.

Color-Vision.

1. The **retina** is divided into three color zones:

(a) The outermost zone responds only with sensations of white and black.

(b) The intermediate zone gives sensations of yellow and blue in addition to white and black.

(c) The innermost zone responds with all sensations of color and brightness.

2. Color-blindness—is the inability to distinguish colors widely distant in the spectrum.

(a) Red-green is the most common form. especially in men.

(b) Yellow-blue is very rare.

(c) Total is rare.

3. Theories of Color Vision—are the attempts to explain what goes on in the retina when we see colors.

Young-Helmholtz Theory.

(1) Assumes that there are three primary colors red, green, and blue; and that there are three separate organs in the retina that are affected by each of these colors.

(2) White is produced by the simultaneous stimulation of all three. Black is the absence of all stimulation.

(3) Yellow is produced when red and green are stimulated together.

(4) All other colors are produced by the mixture of the effects of two or all three of the organs.

(5) Negative after images are due to the fatigue of some of the organs and the response of those remaining, when white light falls upon the retina.

(6) Positive after images are due to the inertia of retinal processes.

(7) Simultaneous contrast is an illusion of judgment.

(8) Color-blindness is due to the absence of one or more of the retinal organs.

Criticism.

(1) Yellow cannot be a compound color since it may

be seen where its assumed components are lacking—on the periphery of the retina and by red-green color-blind people.

(2) Likewise, white can be seen where none of its components are present.

(3) The explanation of negative after images falls with the abandonment of the theory that white light is a compound color.

(4) Contrast is not an illusion of judgment, as it is most easily noticed when one is not aware that the inducing color is present.

(5) The color-blindness of sets of colors is not explained.

(6) Black as a sensation is not accounted for.

The Hering Theory.

(1) There are three pairs of primary colors: red and green, yellow and blue, white and black. There are three kinds of organs in the retina, each being affected by one of these pairs of colors. Each organ is capable of antagonistic processes, one process producing one color and the antagonistic process producing the other.

(2) Complementary colors are explained by the fact that members of the same pair of colors tend to induce opposed processes in the same degree. The processes neutralize each other and gray results.

(3) Color-blindness is due to the absence of one or more of these organs. This explains the color-blindness of sets of complementary colors.

(4) Positive after images are due to the inertia of retinal processes.

(5) Negative after images are due to processes antangonistic to those producing the original image. The

opposing process takes place to restore the equilibrium of the retinal organs.

(6) Contrast is due to one process inducing its opposite in contiguous areas.

Criticism.

(1) Nowhere else in the body is a building-up process induced by stimulation.

(2) Opposed processes in the color organs are assumed to cancel each other but in the black-white organ they give a gray sensation.

Ladd-Franklin Phylogenetic Theory.

(1) Color vision has gradually developed from colorless or brightness vision.

(2) In the earliest stage of its development the visual sense consisted only in sensations of brightness.

(3) In the course of development, the retinal substance became differentiated into two component substances, one sensitive to blue and the other to yellow.

(4) Later, the yellow substance split into two components, one sensitive to red and the other to green.

(5) This development accounts for the color zones of the retina. Peripheral vision represents the first stage of brightness vision only. The middle zone of the retina sensitive to yellow and blue as well as to white and black, was the second stage of development. The last stage resulted in the innermost zone, which responds to red and green in addition to yellow and blue, and white and black.

(6) Each more involved substance may act as a whole to give its original sensation. Thus, red and green acting together give yellow. Yellow and blue simul-

taneously stimulated produce gray. This explains complementary colors and color mixing.

(7) The color-blind eye is an undeveloped eye. In red-green color-blindness the yellow substance has not yet subdivided and in total color blindness the elementary gray substance alone is present. This accounts for the color-blindness of pairs of colors. Since red-green vision is the latest to develop, it is the most likely to fail to appear.

Criticism.

(1) The theory does not explain the differenec between rod and cone vision.

(2) It fails to explain contrast and after images.

(3) Black as an independent sensation is not accounted for.

II. Audition

Stimuli. Sound waves that vibrate between 16 and 30,000 times per second.

Receptor. The ear which consists of three parts:

1. *External ear*—includes.

(a) Pinna (outer shell)—collects air waves and directs them into the meatus.

(b) Meatus—the tube which conducts the sound waves from the pinna to the middle ear.

2. *Middle ear or Tympanium*—a cavity bounded on one side by the ear drum and on the other by a bony wall.

(a) Ear drum—separates the external from the middle ear. It is set into vibration by air waves conducted from the external ear.

(b) Ear bones—hammer, anvil, and stirrup. These bones stretch across the middle ear from the ear drum to the bony wall. They transmit the air vibrations of the ear drum to the fluid of the cochlea canal.

(c) Bony wall—connects the middle with the inner ear. It contains two openings: the oval window and the round window, each of which is fitted with a vibrating membrane.

(d) Beginning of the Eustation tube—connects the ear with the throat. This tube equalizes the air pressure on both sides of the ear drum.

3. *Inner ear*—is filled with a lymph fluid.

(a) Vestibule—formed by the utricle, the saccule, and the semi-circular canals.

(b) Cochlea—is the actual receptor for hearing. It consists of three canals: upper, lower, and central. Along the latter canal lies the basilar membrane, which is composed of a series of fibers which vary in length. This membrane takes up the vibrations of the fluid, thus stimulating the organ of corti.

(c) Organ of Corti—consists of hair cells which are attached to the basilar membrane. These hair cells connect with the auditory nerve, so that their stimulation results in nerve impulses to the cortex.

How We Hear

Sound waves strike the ear drum and cause it to vibrate. These vibrations are transmitted through the ear bones of the middle ear and set up waves in the fluid of the cochlea. These waves cause the basilar membrane to vibrate, which in turn stimulates the sense cells in the organ of corti. The auditory nerve

in contact with these cells communicates the impulse to the temporal lobe of the cerebral cortex.

What We Hear

1. Qualities of auditory sensation.

Pitch—ranges from the lowest to the highest audible note. Depends upon the rate of the vibrating sound waves.

Intensity—the range of loudness. Depends upon the amplitude of the sound wave.

Quality—the purity of a tone. Depends upon the overtones accompanying the fundamental.

2. Tones and Noises.

Tones—are those auditory sensations caused by the periodic vibrations of air striking the ear drum.

Noises—are inharmonious combinations of many tones caused by non-periodic vibrations of air striking the ear drum. A noise is also produced when a tonal stimulus is interrupted before two complete vibrations have been heard.

3. Beats.

Alternate waxing and waning of a tone, due to the reenforcement and interference of two notes whose wave lengths are almost equal.

4. Combination Tones.

When two different tones within an octave are sounded simultaneously, combination tones are heard in addition to the two primary tones. Combination tones are of two kinds:

(a) Summation tone—corresponds to the sum of the vibration frequencies of the two primary tones.

(b) Difference tone—corresponds to the difference of these frequencies.

5. Consonance—the pleasantness of a musical interval.

Theories of Consonance

(a) **Helmholtz Theory.**

Consonance is due to the presence of identical overtones and to the absence of beats. Dissonance is due to the lack of identical overtones and to the presence of beats.

(b) **Stumpf's Theory.**

Consonance is due to the fusion of tones into a unitary impression.

(c) **Moore's Genetic Theory.**

Consonance is due to the pleasure afforded the individual when he succeeds in synthesizing two tonal elements into a unified complex. The degree of pleasure is proportional to the difficulty experienced in attaining success. Dissonance is due to the inability of an individual to synthesize the tonal elements into a unitary impression.

Theories of Hearing

1. Helmholtz.

Hearing is due to the vibration of the fibers of the basilar membrane, each fiber vibrating with a particular frequency.

Criticism:

(a) The fibers are not capable of vibrating as freely as the theory requires.

(b) The variation in the length of the fibers is not enough to account for the range of audition.

2. Rutherford—Telephone Theory.

The cochlea acts like a telphone receiver and transmits vibrations to the cortex, where analysis of the sound sensation takes place.

Criticism:

Such theory cannot at present be verified experimentally.

3. Ewald.

Combinations of fibers vibrating in various patterns give the range of tones.

Criticism:

(a) All auditory receptors cannot be involved in hearing every tone.

(b) The results of the theory are inconsistent with experience.

4. Max Meyer.

(a) Pitch is due to the rate of vibration of the basilar membrane as a whole.

(b) Loudness is due to the extent of the basilar membrane excited.

Criticism:

Does not explain how the auditory receptor responds to rates of change of stimulation.

III. Smell

Stimuli. Minute odorous particles which emanate from various objects.

Receptors. Spindle shaped cells embedded in the lining of the nostrils.

Elementary odors: 1. Fruity—vinegar, grapes. 2. Flowery—pansy, carnation. 3. Putrid—limburger cheese. 4. Resinous—turpentine. 5. Spicy—cinnamon. 6. Scorched—tar.

IV. Cutaneous Sensations

Touch or Pressure.

Stimuli. Deformation of the skin surface by any physical substance or mechanical impact.

Receptor. The touch corpuscle with its accessory cells.

Warmth

Stimuli. (a) Substances whose temperature is above the state of adaptation of the warmth sense organ.

(b) Organic changes within the body causing dilatation of the blood vessels—as in fevers.

(c) Mechanical stimulation—as mustard.

Receptor. The cylindrical end-bulb in the skin.

Coolness (cold)

Stimuli. (a) Substances whose temperature is below the state of adaptation of the cold sense organ.

(b) Organic changes within the body causing constriction of the blood vessels—as in extreme emotion.

(c) Mechanical stimulation—as alcohol.

A paradoxical cold sensation is experienced when a cold spot is stimulated by an object whose temperature is between 45 and 50 degrees centigrade.

Receptor. The spherical end-bulb within the skin.

Pain

Stimuli. Any object that damages or threatens to damage the skin. It may be mechanical, thermal, chemical, or electrical.

Receptor. The free nerve-ending in the skin, which is the branch of a sensory axon.

V. Static or Equilibrium Sensation

Stimuli. The change of pressure on the hair cells in the semi-circular canals, due to rotary movements of the head or to the change of the equilibrium of the body as a whole. Excessive stimulation of the canals gives the sensation of dizziness.

Receptors. (a) Semi-circular Canals—stimulated by turning movements.

(b) Saccule and Utricle—activated by straight movements.

These organs maintain and regulate the equilibrium of the body.

VI. Kinesthetic Sensation

Stimuli. The mechanical pressure and state of strain in the muscles, tendons, and joints that results from any bodily movement.

Receptors. The sense organs in the muscles, tendons, and joints.

The muscles are both sense organs and motor mechanisms. The innervation of motor nerves in the muscle causes movement. This movement in turn stimulates sensory endings in the muscles and tendons,

giving rise to new motor impulses. These impulses then arouse the muscle to move again. This process is repeated until a series of related acts is executed and is known as a chained response.

VII. Taste

Stimuli. Soluble substances which are: 1. Sweet. 2. Sour. 3. Salty. 4. Bitter.

Receptors. Bulb-shaped bodies inserted in the mucous lining of the tongue and palate.

VIII. Organic Sensations

1. *Hunger*—initiated by the rhythmical muscular contractions of the stomach.

2. *Thirst*—initiated by the dryness of the soft palate.

QUESTIONS

1. What are the traditional five senses? What senses are omitted from that classification?

2. Name some physical phenomena to which we are not sensitive.

3. Why do a series of individual pictures appear to be continuous when they are presented in rapid succession?

4. In what three ways may sound waves vary? How do these variations affect auditory sensations?

5. What sensations are aroused by placing the hand in boiling water?

6. What are the three laws of color mixture?

7. What is meant by saying that everyone is partially color-blind?

8. Discuss one theory of color vision, describing what facts of vision it explains and what its limitations are.

9. Briefly describe the structure of the ear.

10. Define: beats, consonance, combination tones, tones, noises.

11. Discuss critically four theories of hearing.

12. *Mark the following true or false:*

(a) Black is the absence of all sensation.

(b) According to the Ladd-Franklin theory, one who is color-blind to red cannot see green.

(c) If the semicircular canals were destroyed, one would be unable to hear.

(d) Yellow and blue are complementary colors.

(e) The basilar membrane is in the retina.

(f) There are only four taste sensations.

CHAPTER III

THE NERVOUS SYSTEM

THE CEREBRO-SPINAL SYSTEM

Structure

Neurone—unit of structure.

Neurones are the cells that make up the nervous system. They consist of a cell-body with its axons and dendrites. There are three kinds of neurones:

1. *sensory* or *afferent*—run from receptor to nerve center.

2. *central*—connect sensory with motor neurone.

3. *motor* or *efferent*—run from nerve center to muscle or gland.

Neurones are connected end to end, the axons of one neurone being enmeshed with the dendrites of the adjacent one. This forms a pathway along which nerve impulses travel. The points of contact of two successive neurones is called a synapse. Nerve impulses always move in one direction—from dendrite to cell-body and along the axon until it crosses the synapse to an adjacent dendrite. The varying resistances at different synapses determine the direction that the nervous impulses take.

A neurone may be:

(1) a link in the chain of a simple nervous circuit.

(2) adapted to collect nervous impulses from different sources and discharge them into a single final common path. (3) adapted to receive nervous impulses of one kind and distribute them into several parts of the nervous system.

NERVE CENTERS

A collection of neurones in the brain or spinal cord having a definite function is called a nerve center. To this center come axons from receptors and other nerve centers, and from this center run axons to effectors and to other centers.

A group of neurones located outside of the brain or cord is called a **ganglion.**

DIVISIONS OF THE NERVOUS SYSTEM

1. Brain.

Medulla Oblongata—is just above the cord. It is the region where:

1. motor fibers cross.
2. fibers connect the cord with the higher centers of the brain.

Cerebellum—is in back of and above the medulla.

1. Contains centers for coordinating movements.
2. By its activity we maintain equilibrium and make simple motor adjustments without special attention.

Cerebrum—is divided into two hemispheres. It consists of:

(a) basal ganglia—which contains the lower control centers for receiving impulses from the receptors.

(b) cortex—the layer of gray matter forming the

outer surface of the cerebrum. Contains the sensory, motor, and association areas. It controls the highest intelligent activities such as thought and perception.

2. Spinal Cord—is composed of white axon fibers surrounding a grayish mass. All sensory and motor nerves below the head terminate in the cord. The two functions of the spinal cord are:

(1) The conduction of sensory impulses directly to motor neurones in the cord so that a nerve impulse may come into the cord and pass out without going up to the brain. This direct connection causes the knee-jerk and other spinal reflexes.

(2) The conduction of sensory impulses to the brain and motor impulses from the brain. This produces voluntary movements.

3. Peripheral Nerves—are those that form the pathways which connect the centers in the brain or cord with the receptors or effectors.

Sensory or **Afferent nerves**—connect the receptors with the cord or the brain, carrying nerve impulses inward from some receiving organ to some center.

Motor or **Efferent nerves**—connect the cord or brain with effector organs, carrying impulses outward from some center to some effector.

Spinal nerves—31 pairs of sensory and motor nerves which connect with parts of the body below the head, passing into the cord on their way to or from the brain.

Cranial nerves—12 pairs of sensory and motor nerves in the head which enter the brain directly, without passing through the cord.

Function

Reflex—unit of function.

Reflexes are:

1. Prompt motor responses to sensory stimuli.
2. Least variable and most constant of all responses.
3. Almost totally determined by native factors.
4. Mechanical without consciousness or purpose.
5. Generally useful to the organism.

Simple Reflexes—are external or internal, muscular or glandular.

Lid reflex—wink of the eyes in response to anything touching the eyeball.

Patellar reflex—aroused by a blow on the patellar tendon.

Pupillary reflex—narrowing of the pupil of the eye in response to sudden light.

Flexion reflex—pulling up of the leg in response to threatening injury to the foot.

Coughing and sneezing.

Movements of the stomach and intestines.

Swallowing and hiccoughing.

Discharge of saliva from the salivary glands.

Flow of tears when a cinder gets into the eye.

Compound Reflexes.

Allied—when an afferent neurone is in functional connection with several efferent neurones. This allows two or more effector activities to go on at the same time and makes possible a big movement in response to a moderate stimulus.

Antagonistic—when an afferent neurone is in functional connection with more than one effector neurone,

but only one of the responses is possible at a time, e.g., extension and flexion of the arm. In this case there is an inhibition at the synapse of one of the efferent pathways, while the other is being used (reciprocal innervation).

Chain—where one movement becomes the stimulus for the following movement.

Circular—is a special type of chain reflex. The afferent impulse, originating from the effector response, passes back to the brain or cord and out again through the same efferent pathway previously used. The effect of this circuit is to maintain or repeat the muscular response.

Conditioned—when a stimulus originally inadequate to call forth a given reflex becomes capable of doing so.

Reflex Arc.

A **receptor** is stimulated by some force or agent from within or from without the body.

A **nerve impulse** starts in the sensory neurone connected with this receptor and travels along a sensory path to a center in the cord or brain.

There is a **correlation of impulses** at the sensory center and the conduction of impulses to motor centers.

Motor impulses are transmitted from motor centers along some motor nerve to a muscle or a gland.

The **muscle** or **gland** becomes activated to respond.

REFLEX CENTERS

The lower motor centers are located in the cord or brain stem and give off motor axons which innervate the muscles and glands to activity. These reflex centers may be aroused in two ways:

1. By a sensory stimulus which causes a lower motor center to respond with a reflex.

2. By a higher motor center in the cortex acting through the pyramidal tract upon the lower centers. These centers in turn act upon the effectors. This produces voluntary movement and the facilitation and inhibition of reflexes.

LEVELS OF REACTION

The function of the nervous system is to transfer sensory impulses to motor neurones, which subsequently stimulate muscular or glandular action. This transfer may take place at three levels in the nervous system:

1. At the level of the simple reflex in the cord or brain stem.
2. At the level of the cerebellum.
3. At the level of the cortex.

REACTION TIME

Simple reaction—the subject executes a definite movement as promptly as possible, in response to a stimulus which he expects, e.g., presses a key when a light is shown.

Choice reaction—the subject responds differentially to two known stimuli, only one of which is presented at a time. For example, the subject reacts with the left hand when a red light is shown and with the right hand when a green light is presented.

Associative reaction—the subject responds according to instructions, but the exact nature of the stimulus

is not known. He may be asked to respond with the opposites to a certain list of words.

THE AUTONOMIC NERVOUS SYSTEM

The autonomic nervous system is that portion of the nervous system innervating the visceral organs. It is not an independent system but an extension of the cerebro-spinal. The autonomic system consists of:

1. A chain of ganglia on either side of the spinal cord.
2. Several ganglia in the viscera of the body cavity.
3. Three small ganglia in the head.
4. Nerves connecting these ganglia with each other.

Structure

There are two divisions antagonistic to each other.

1. **Cranial-Sacral division**—active in states of organic tranquillity, conserves energy and helps recuperation.
   (a) Stimulates digestion and sexual activity.
   (b) Increases the tonicity of visceral muscles.
   (c) Contracts the pupil.

2. **Sympathetic division**—active during emotional excitement, liberating energy useful for the protection of the organism in emergency.
   (a) Stimulates the activity of the heart and lungs.
   (b) Inhibits digestion and sexual activity.
   (c) Excretes sweat and secretes adrenin.
   (d) Dilates the pupil.

Function

The body of a preganglionic neurone lies in the spinal cord or brain and its axon runs into a ganglion of the autonomic nervous system. Within this ganglion a postganglionic neurone by synaptic connection takes up the motor impulse and relays the impulse to a visceral gland or muscle.

Functions of the Nervous System.

1. Conducts impulses from the sense organ to the muscles and glands.

2. Offers a potential connection between each part of the body to any other part.

3. It permits motor coordination—the simultaneous arousal of a large group of muscles by a single stimulus.

4. Makes possible a unitary reaction to complex sensory situations.

5. Permits of a high degree of variability of response to the same stimulus, making learning possible.

QUESTIONS

1. Name the three kinds of neurones and explain the function of each kind.
2. Why should the nervous system be studied in psychology?
3. What are the main divisions of the nervous system?
4. Give five characteristics of a reflex.
5. Describe the reflex arc.

6. What are the two main divisions of the autonomic nervous system? What are their functions?

7. Define: neurone, nerve center, synapse, ganglion, cortex, autonomic nervous system.

8. *Mark the following true or false:*

(a) The right side of the brain controls the right side of the body.

(b) All glands are controlled by the autonomic nervous system.

(c) The flexion reflex is aroused by a blow on the patellar tendon.

(d) A synapse is a connection between a nerve and a muscle.

(e) An adult has more synapses than a child.

(f) A single stimulus may elicit a multiple response.

CHAPTER IV

ORGANS OF RESPONSE

MUSCLES

Striped or Skeletal (Voluntary)

Structure.

These muscles vary greatly in size and constitute the greatest part of the body. Each muscle consists of a number of muscle fibers which lie parallel to each other, giving a striped appearance. Each muscle contains both sensory and motor nerve endings, such arrangement making possible the chained response. The speed with which the muscle reacts depends upon:

1. The muscle used.
2. The receptor to which the stimulus is applied.
3. The condition of the synapses in the neural pathway.

Function.

(1) **Muscle Tone (Tonic contraction).** The constant state of contraction or tension which makes the muscle always ready for overt action.

(2) **Contraction**—caused by a motor impulse to the muscle.

Simple. Contraction due to a single stimulus, such

as a blow on the patellar tendon, or to a constant repetition of the same stimulus. The contraction shows three phases: (a) Warming-up period—gradual increase of contraction. (b) Period of maximum contraction. (c) Period of decreasing contraction—relaxation.

Compound (*Tetanic*). Prolonged contraction of a muscle produced by a rapid succession of intermittent stimulations. The impulses come so rapidly that the muscle has no time to relax and hence remains in a state of contraction as long as the stimulus lasts.

(3) **Summation of Stimuli.** A succession of minute stimuli, which individually are too weak to be effective, by a cumulative effect becomes adequate to call forth a response.

(4) **Reciprocal Innervation.** When the muscles for one activity are stimulated, the muscles that produce the opposite activity are inhibited. Thus, whenever a motor impulse contracts the flexor muscles of the arm, a neural impulse relaxes the extensor muscles at the same time. This results in greater smoothness, coordination, and flexibility of muscular movements.

Unstriped or Smooth (Involuntary)

Structure.

These are found in the visceral organs and are composed of minute spindle-shaped cells which have a single nucleus.

Function.

The smooth muscles are under the control of the post-ganglionic neurones of the automatic nervous sys-

tem. These muscles control the vegetative life of the organism. In general, they function more sluggishly than the skeletal muscles.

GLANDS

Glands are the secreting organs of the body all of which are innervated by the autonomic nervous system.

(1) **Duct Glands**—are those which have a well-marked opening or outlet for its products.

Salivary glands—are located in the mouth and secrete saliva.

Pancreas—is located near the small intestine and secretes pancreatic juice.

Liver—secretes bile which is used in digestion.

Kidneys—take waste products from the blood.

Sweat glands—lie in the deep tissues of the skin. The duct is composed of smooth muscle cells and open upon the surface of the skin in pores.

Sebaceous glands of the skin—secrete an oily liquid which protects the hair and gives the skin an oily appearance.

(2) **Ductless or Endocrine Glands**—are those whose secretion is absorbed directly into the blood stream and is distributed by it to other tissues.

Thyroid—is located near the larynx and secretes thyroxin, whose chief constituent is iodine. Over-activity of this gland causes abnormal emotional excitability and is frequently accompanied by exophthalmic goitre. Insufficient secretion causes cretinism.

Parathyroid—are four exceedingly small glands, two on each side of the windpipe. These glands secrete hormones which restrain the over-activity of the nervous

system. When these glands are not functioning there is excessive discharge of energy, often the slightest stimulus resulting in convulsive contractions of many muscles. The removal of these glands results in death.

Adrenal—are two in number, one located above each kidney. These glands are especially active in violent emotions secreting adrenin which stimulates the heart and lungs, and increases the strength and endurance of the striped muscles.

Suprarenal—the secretion of this gland inhibits the smooth muscle movements and glandular secretions that are involved in digestion.

Pituitary—located at the base of the brain and stimulates the involuntary muscles of the body. An excess of secretion from this gland causes giantism and often a marked decrease in intelligence.

Sex—these glands furnish an external secretion contributing to reproduction and an internal secretion influencing the development of secondary sexual characteristics.

Thymus and Pineal—the role of these glands is limited to the pre-adult stage of the individual's life, and exerts a restraining influence on the rate of bodily growth and sexual maturation.

QUESTIONS

1. Explain: muscle tone, tetanic contraction, summation of stimuli, reciprocal innervation, endocrine glands.
2. Name and locate four duct glands and five ductless glands. Give one fact about each gland.
3. *Mark the following true or false:*

(a) Smooth muscles are used in the flexion reflex.

(b) The contraction of voluntary muscles is brought about by the motor neurones of the cerebro-spinal system.

(c) The movements of the striped muscles are slower than those of the smooth muscles.

(d) The adrenal glands are active in the emotional response of anger.

(e) A reaction is always a response by a muscle.

(f) The motor area of the brain is in direct connection with some muscles.

(g) The adrenal secretion exerts a very stimulating effect on the digestive organs.

CHAPTER V

INSTINCT

WOODWORTH'S VIEW

Definition.

Instinct is an innate tendency or drive to reaction which persists until the end result is accomplished, facilitating reactions that are preparatory and inhibiting others. In terms of the nervous system, an instinct is the activity of a team of neurones so organized and so connected with muscles and sense organs, as to arouse certain motor reactions in response to certain sensory stimuli.

Criteria.

1. Appearance of the trait at birth.
2. Universality of the trait.
3. Native reactions that could not have been learned.

Partially and Fully Organized Instincts.

1. In partially organized instincts the innate drive is not firmly linked with any specific reaction but is loosely linked with many different reactions. This makes possible variable behavior and learning.

2. A fully organized instinct is one where the necessary preparatory reactions are linked up closely with

the main reaction tendency, so that, once the main tendency is aroused to activity, the preparatory reactions follow with great sureness.

List of Instincts.

Response to organic needs. (a) Drinking. (b) Hunger. (c) Breathing and air getting. (d) Responses to heat and cold. (e) Shrinking from injury. (f) Crying. (g) Fatigue, rest, and sleep.

Responses to other persons. (a) Herd or gregarious instinct. (b) Mating instinct. (c) Parental or mothering instinct.

Play Instincts. (a) Playful activity. (b) Locomotion. (c) Vocalization. (d) Manipulation. (e) Exploration or curiosity. (f) Caution and contentment. (g) Laughter. (h) Fighting. (i) Self-assertion. (j) Submission.

Native and Acquired Traits.

Acquired traits are developed on the basis of native traits but the acquired elements in character are more numerous and much stronger than the inherited ones.

Native	*Acquired*
1. Reflexes	1. Skilled movements
2. Sensations	2. Meanings and ideas
3. Primary emotions	3. Sentiments
4. Native impulses	4. Desires and interests
5. Aptitudes for certain work	5. Acquired abilities

WATSON'S VIEW

Criticism of the Subjective View.

Instincts as patterns of response are really consolidations of native behavior and habit. In some, original activities predominate; in others, the pattern as a whole is largely composed of habit elements.

Definition. An instinct is a combination of congenital responses unfolding serially under appropriate stimulation. Congenital responses are those which are learned during the embryonic life of an individual and must be differentiated from inherited responses, which are determined in the fertilized ovum.

List of Important Unlearned Responses.

1. Sneezing. 2. Hiccoughing. 3. Crying. 4. Smiling. 5. Movements of eyes, head, hands, and feet. 6. Grasping. 7. Hunger contractions, digestion, and circulation.

How Our Unlearned Behavior Is Modified—Conditioning.

1. *Conditioning of Stimulus.* An adequate stimulus and an inadequate stimulus are presented simultaneously. The organism responds as it characteristically does to the adequate stimulus. After several such presentations, the inadequate stimulus alone calls forth the response previously made only to the adequate stimulus.

For example, a red light is shown at the same time that the hand of the subject is stimulated by an electric current. The electrical shock produces withdrawal of the hand. If this procedure is repeated a number of

times, the presentation of the red light alone will cause withdrawal of the hand.

By this method the range of stimuli that call forth a certain response is increased enormously.

2. *Conditioning of Response.* When a certain response to a stimulus becomes unsatisfactory, a new stimulus is found which gives a satisfactory substitute response and this response then becomes attached to the original stimulus.

For example, the sight of a dog may elicit a response of manipulation and laughter from the child. If the dog bites the child, the original response of petting becomes unsatisfactory. The child then responds to the biting by withdrawal and crying. This response becomes attached to the original stimulus dog.

By this method the range of responses to a single stimulus is greatly increased.

Characteristics of the Conditioned Response.

1. The adequate stimulus must be presented simultaneously or after the inadequate stimulus. If the adequate stimulus precedes the inadequate, the conditioned response is not formed.

2. The conditioned response is temporary and unstable. It breaks down with lack of practice but is quickly reestablished.

3. The magnitude of the response is proportional to the strength of the stimulus.

4. There is a marked summation effect. If a dog is conditioned separately to sound and to color, the response to both is greater than to either one alone.

McDOUGALL'S VIEW

Definition.

Instinct is an innate psycho-physical disposition which determines its possessor to know of some thing, experience a feeling in regard to it, and to strive towards or away from that object. Each kind of instinctive behavior is always attended by some emotion which is peculiar to that kind of behavior.

Modification of Instinct.

Instincts are the fundamental source of all human activity and determine the ends of all behavior. They are modified by experience in four ways: 1. Instinctive reactions become attached to ideas and objects other than the original adequate stimuli. 2. Bodily movements in which the instinct finds expression may be modified and complicated. 3. When several instincts are excited simultaneously, they blend with various degrees of intimacy and mutually modify each other. 4. Instinctive tendencies become somewhat systematically organized about certain objects or ideas.

FREUD'S VIEW

Classes.

There are two fundamental classes of instincts:

1. *Ego or Self-preserving*—includes hunger and thirst.

2. *Sexual or Race-preserving*—Libido.

This instinct is considered to play the dominant part in initiating and guiding all human activity.

Development of the Libido.

The sex instinct passes through three stages of development.

1. Infantile—from birth to four years of age. This is a pre-inhibitory period in which such responses as shame, modesty, and disgust do not manifest themselves. There is a diffuse sexual life in which the various sex impulses remain separate and unorganized, each seeking erotic satisfaction independently. The conspicuous feature of this period is that the child is autoerotic, *i.e.*, gains satisfaction from its own body.

2. Childhood or Latent Period—from age four until puberty. This period is characterized by the appearance of inhibitory tendencies such as shame and modesty, due to cultural and educational influences. These inhibitions initiate two mechanisms which continue to function throughout the lifetime of the individual.

Repression. Ideas which are painful or sex impulses that cannot be given expression due to social taboos, are relegated into the Unconscious. The repressed ideas may reappear in consciousness, but in order to pass the Censor they must assume some symbolic or disguised form.

Sublimation. Is the utilization of energy, originally belonging to the sex impulses, for some non-sexual form of activity which is more acceptable socially. Thus, sex curiosity is sublimated into the study of medicine, and exhibitionism into dramatic ability.

3. Adult Period—begins with the onset of puberty. The Libido is transferred from the self to others, normally to those of the opposite sex. The impulses of the erogenous zones become organized and are concentrated

chiefly in the genital organs for the purpose of procreation.

ALLPORT'S VIEW—PREPOTENT REFLEX THEORY

Rejects instincts and reduces native reactions to prepotent reflexes which are modified and integrated into complex habits. The human being inherits six classes of prepotent reflexes: 1. Starting and Withdrawing. 2. Rejecting. 3. Struggling. 4. Hunger Reactions. 5. Sensitive Zone Reactions. 6. Sex Reactions.

The prepotent reflexes are modified:

Afferently—by conditional response extending the range and complexity of the stimuli capable of exciting the response.

Efferently.—To define and specialize the response by the selection and fixation of successful random movements in the processes of habit formation and thought.

JAMES'S VIEW—TRANSITORY INSTINCTS

Definition.

Instinct is the faculty of acting in such a way as to produce certain ends, without foresight of the ends, and without previous education in the performance. Man has a greater number of instincts than the lower animals, these being the main sources of action and the basis of all habit.

Nature of Instinct.

The various instincts are transitory, each being dominant at different times in the lifetime of the individual. If the instinct is exercised and is supplemented by a

habit, it becomes permanent; but if it is not used, it gradually dies of disuse.

This view has important implications for pedagogy. The course of study should be so arranged that the various subjects are presented when they appeal to some instinctive tendency.

QUESTIONS

1. Contrast Woodworth's view of instinct with that of Watson.

2. What are the three criteria of instinct? Which criterion is the least reliable? Why?

3. Describe an experiment which would show that children are not afraid of the dark instinctively.

4. Discuss McDougall's view of instinct.

5. What is meant by transitory instincts? In what way is this view of importance to pedagogy?

6. Briefly describe Freud's view of the development of the sex instinct.

7. According to Allport, what are the six classes of prepotent reflexes?

8. *Mark the following true or false:*

(a) Fear of animals is a native reaction.

(b) We do not learn to laugh but we do learn what to laugh at.

(c) Human instincts are highly organized.

(d) Instincts cannot be modified.

(e) All native traits appear at birth.

(f) Some people like music instinctively.

(g) Congenital means the same as native.

9. Explain: Repression, sublimation, conditioned response, partially organized instinct, Libido.

CHAPTER VI

FEELINGS AND EMOTIONS

THE FEELINGS (WOODWORTH)

Elementary Feelings.

Pleasantness—resulting from: 1. stimuli that we like either natively or by learning. 2. the satisfaction of an aroused desire or of an organic need.

Unpleasantness—resulting from: 1. stimuli that we dislike either naturally or from experience. 2. the failure to satisfy an aroused desire or an organic need.

Feelings and Sensations

Feelings.

1. Grow vague and retreat when studied attentively.
2. Are diffuse.
3. Have so special receptors.

Sensations.

1. Become more vivid when selected and observed.
2. Can be localized.
3. Are received through definite sense organs.

Theories of Feeling.

1. Pleasantness represents a general organic state, being an internal bodily response to pleasant stimuli. Unpleasantness is the contrary state caused by unpleasant stimuli.

2. Pleasantness represents smooth and rapid brain action due to low synaptic resistances. Unpleasantness represents slow and impeded brain action due to high synaptic resistances.

3. Pleasantness goes with neural adjustment directed towards keeping the situation unaltered. Unpleasantness goes with an adjustment towards change.

4. Wundt's Tri-dimensional Theory.

Feeling moves, first, between the opposite poles of pleasantness and unpleasantness; secondly, between excitement and depression; and thirdly, between tension and relaxation. A feeling at any given moment is at some point between the opposite poles of each of these three dimensions. Thus, a feeling may be pleasant, excited, and relaxed.

THE EMOTIONS

Woodworth's View

Emotion is a conscious stirred-up state of the organism.

Emotion and Impulse.

1. Emotion is an organic state—a generalized feeling.

2. Impulse is an adjustment of nerve centers toward a certain reaction—a conscious tendency.

Emotion and Instinct.

1. Emotion consists of internal responses preparatory to reaction.

2. Instinct is directed outward toward an end result.

The James-Lange Theory.

First there is the perception of an exciting fact which

is followed by bodily changes in the digestive, respiratory, glandular, or circulatory system—and the feeling of these changes is the emotion. Emotion, then, is the way the body feels and is composed of a complex of bodily sensations.

Emotion is a consequence, not the cause, of physiological changes. We do not cry because we are sad, we are sad because we cry. That is, the conscious state of being sad is composed of the sensations from the muscular and glandular responses of crying.

Criticism of the James-Lange Theory.

1. When the spinal cord is impaired, the body becomes completely paralyzed and insensitive, yet normal emotional feeling may be experienced.

2. Visceral changes may take place without any change of emotion.

3. Specific emotions are not explained.

(a) Many diverse emotions are manifested by the same bodily disturbances.

(b) The same emotion shows a variety of physiological expressions.

4. Emotion consists of other factors, such as pleasantness and unpleasantness, in addition to kinesthetic and organic sensations.

5. The theory is limited to the coarser emotions such as fear and rage.

Watson's View

Emotion is an inherited reaction pattern involving profound changes of the bodily mechanism as a whole but particularly of the visceral and glandular systems.

Types of Emotional Reaction

Fear.

Stimuli: (a) Sudden removal of all means of support. (b) Loud noises.

Responses: (a) Sudden catching of breath. (b) Sudden closing of the eye-lids. (c) Grasping reflex. (d) Crying.

Rage.

Stimulus: Hampering of the infant's movements.

Responses: (a) Crying. (b) Striking movements of hands and arms.

Love.

Stimuli: (a) Stimulation of the erogenous zones. (b) Tickling and patting. (c) Gentle rocking.

Responses: (a) Smiling. (b) Extension of the arms.

How Our Unlearned Emotional Responses Are Modified

Conditioning. A stimulus which originally does not call out an emotional response can be made to do so by presenting it simultaneously with some stimulus that does elicit an emotional response.

A white rat presented to a child calls forth a response of manipulation. A loud noise causes a fear response. When a loud noise is sounded at the same time that the white rat is being presented to the child, the child manifests a fear response. After several such simultaneous presentations, the animal alone calls out the fear response.

Transfer by Analogy. When an emotion is conditioned, a wide range of stimuli that look like the con-

ditioned stimulus will call forth the conditioned response. If the child has been conditioned to react with a fear response to the rat, it will act the same way toward any furry object such as a rabbit, a fur coat, and cotton wool.

McDOUGALL'S VIEW

Definition.

Emotion is an inevitable component of every instinctive action, each principle instinct being coupled with a primary emotion.

Classification.

There are three groups of emotions:

Primary—those which are always aroused with their corresponding instinct, *e.g.*, the tender emotion with the parental instinct.

Secondary or Blended—occur when more than one instinct is stimulated at a time. These emotions may become organized into sentiments about certain things and ideas.

Derived—are those which are not constantly correlated with any one instinct but which are derived from the working of the impulse.

Allport's Theory of Feeling and Emotion

This theory attempts to explain the affective basis of emotion and how the emotions in a single affective class are distinguished from each other physiologically.

Affective basis. All emotions are either pleasant or unpleasant. Pleasant emotions, such as love and mirth,

are due to the functioning of the cranio-sacral division of the autonomic nervous system. Unpleasant emotions, such as fear and grief, result from the action of the sympathetic division.

The evidence for this is that: 1. Unpleasantness is more definite, identifiable, and imperative than pleasantness. 2. Sympathetic motor impulses are stronger than, and are prepotent over the cranio-sacral. 3. Unpleasantness is aroused slower than pleasantness due to the higher synaptic resistance in the sympathetic division, and the slower rate of transmission in these fibers. 4. The two divisions function antagonistically.

Differentiating factor. The kinesthetic sensations of the body arising from the stimulation of the proprioceptors in the muscles, tendons, and joints of the somatic part of the organism.

ORIGIN OF EMOTIONAL EXPRESSION

Darwin's View

Survival of serviceable associated habits. Many forms of emotional expression are inherited vestiges of acts useful during an earlier period of racial history. The scornful curl of the lips exposing the teeth in anger dates back to the time when teeth were used in fighting.

Antithesis. Emotions are arranged in pairs of opposites. In one emotion, a certain expression is manifested and in the opposite emotion, the opposite reaction is executed.

Direct action of the nervous system. In emotion there is a diffuse overflow of nervous energy into whatever channel affords the readiest outlet. The effects thus pro-

duced are trembling, blushing, and the erection of the hair.

Allport's View (Modification of Darwin's)

1. Emotional expressions have survived because they become important in adapting the individual to the social environment. Showing the teeth accompanies biting and attacking. Then by conditioned response the showing of the teeth alone has the same effect as biting and attacking.

2. Emotions are not antithetical, but the opposite feelings of pleasantness and unpleasantness that comprise the emotions are. Emotional expressions are antithetical because they contain these two antagonistic facial reactions.

3. Facial expression is part of the diffuse emotional response which is controlled by the autonomic nervous system.

EMOTIONAL BEHAVIOR

Adaptive.

Physiologically, emotion is a state of preparedness for action in which both the voluntary and involuntary nervous systems function the same as in the action itself. Each organ and tissue in the body is stimulated or inhibited in accordance with the part it is to play in the intended response. The circulation is accelerated and the blood is transferred from parts non-essential to muscular action to those mechanisms necessary for the functioning of the muscles.

During intense emotion there is an increased secretion

of adrenin into the blood. This chemical has three powerful effects: 1. It causes the liver to liberate stored sugar, providing a readily assimilable food. 2. It increases the tendency of the blood to coagulate when exposed to air, thus lessening the loss of blood. 3. It constricts the small blood vessels which increases the blood pressure and diminishes fatigue.

Non-Adaptive.

1. Extreme emotion interferes seriously with skilled movements. The response is diffuse, disorganized, and poorly coordinated.

2. The individual is especially responsive to distractions.

3. Digestion is inhibited and if this condition is prolonged, the efficient functioning of the organism is seriously interfered with.

MEASUREMENT OF EMOTIONS

Free Association Test.

The subject responds to the given stimulus word with the first word that comes to his mind. Because of common environment and experiences many people give the same response to a stimulus word and require about the same time to do it. If the response is unusual in any way, it indicates that it contains some special emotional significance for the individual. Such responses have any of the following characteristics: 1. Long reaction time. 2. Too rapid response. 3. Failure to respond. 4. Repetition of the stimulus word. 5. Responding to different stimulus words with the same word.

Psycho-Galvanometer.

Emotional stimuli are presented and their effect is recorded by the deflection of the galvanometer needle, the greater the emotion the more the deflection.

Measurement of Physiological Functions.

1. *Plethysmograph*—records changes in the volume of the blood.

This instrument consists of a rubber glove surrounded by water which fills a cylindrical vessel and communicates with a recording device. As the volume of the blood increases and decreases, a tracing on smoked paper is indicated.

2. *Pneumograph*—measures changes in respiration by recording fluctuations in the circumference of the chest while breathing.

3. *Automatograph*—records minute involuntary movements of the arm.

4. *Cardiograph*—shows fluctuation of heart beats.

Dreams—reveal emotional tensions.

Questionnaire—inquiring as to the emotional behavior of the individual.

QUESTIONS

1. State four theories of feeling.
2. Contrast feelings with sensations.
3. Explain the James-Lange theory of emotions. What criticisms may be made against the theory?
4. What is the fundamental difference between Woodworth's definition of emotion and that of Watson?
5. Discuss Allport's theory of feeling and emotion.

6. What methods may be used to study emotions experimentally?

7. *Mark the following true or false:*

(a) The adrenal secretion protects the limbs against fatigue.

(b) Expressive movements are of no aid in judging the emotional state of another person.

(c) The internal changes that occur during emotion can be readily ascertained by introspective methods.

(d) Emotional responses can be conditioned to new stimuli.

(e) The accepted theory of feeling is that of James-Lange.

(f) Since emotions are subjective, they cannot be measured.

(g) The pneumograph records changes in the volume of the blood.

CHAPTER VII

ATTENTION

WOODWORTH'S VIEW

Definition. Attention is the focusing of consciousness.

Classes

Involuntary. In which attention is aroused by intense or naturally exciting stimuli, and may be in direct opposition to our desire of attending to something else. Genetically, this is the first kind of attention and is chiefly dependent on the native factors of advantage in the stimulus.

Voluntary (Active or Controlled). In which an effort is made to keep some impressions in the focus of consciousness. This is the stage of growth and development, attention depending on extraneous motives such as fear and self-assertion.

Non-Voluntary (Spontaneous or Passive). In which the object in the focus of consciousness is neither aided nor opposed by effort. This is the final stage in attention, depending on the acquired factors of advantage.

Laws of Attention

Law of Shifting. Our response to the content of focal consciousness is always changing. This brings

different aspects of the same thing into the foreground in rapid succession. The initial response has some kind of an advantage at first, but soon loses this advantage and an alternative response is made. This fluctuation of attention is due to: (a) fatigue and recovery of cortical areas involved (Central theory). (b) varying efficiency of the sense organs (Peripheral theory).

Law of Advantage. The advantage of the initial response and of the alternative responses is due to certain factors of advantage. (a) Changing position or condition of the stimulus. (b) Intensity, frequency, recency, and primacy of the stimulus. (c) Instincts, previous experience, and habits of attention. (d) Mental set—momentary interests and desires causing the facilitation of nervous impulses in harmony with what is expected and the inhibition of others. (e) Striking quality. (f) Definite form.

Law of Selection. Only one of two or more inconsistent responses can be made to the same situation at the same time. Thus, the range of attention is limited to one stimulus or to a complex of stimuli. In the latter case, a single response may be made to several stimuli and conversely, two or more stimuli may arouse a single joint response **(Law of Combination).**

Those who appear to do several things at once: (a) shift with great agility from one activity to another or (b) some of the activities are automatic and do not require attention.

Law of Degrees of Consciousness. An attentive response is conscious to a higher degree than any inattentive response made at the same time.

Behavioristic View. (Smith and Guthrie)

Attention is the orientation of sense organs toward the source of stimulation, the lowering of the response threshold, and the cessation of movements that do not serve to explore the object that is attended to.

The fluctuation of attention is due to the fluctuation of the muscular adjustment and of the conductivity of the neural arc.

Motor Aspects of Attention.

1. The orientation of the sense organs toward the source of stimulation so as to receive the full effects of the stimulus. For example, the eye is turned so that the object of vision falls on the fovea.

2. Contraction of most voluntary muscles due to the diffuse discharge of nervous impulses. This results in the wrinkling of the brow and the clinching of the teeth.

3. The inhibition of all movements that do not serve to explore the object that is attended to.

4. There is a change in the non-voluntary physiological processes. Breathing is checked or quickened and blood pressure rises or falls.

Structural View. (Titchener)

Attention is identical with sensory clearness.

Consciousness or the field of attention is arranged into a focus and a margin. The focus is comprised of whatever is clearest and most distinct in consciousness. The margin is outside of the focal region and is made up of materials which are decreasingly clear as one

passes away from the focus. The difference between the process at the focus and the process in the margin is essentially a difference of clearness.

Functional View. (Angell)

Attention is the most general attitude of adjustment to strong physical stimuli. It is the first act in the process of mental and motor adjustment which puts us in a position to better perceive the situation. Such adjustment is obviously of a biological utility to the organism.

Gestalt View.

Change in attention is not a difference in clearness but is due to the fact that a new figure with new properties has appeared. What is attended to depends upon the configuration and the laws that govern it. One configuration is preferred in perception to another because it is a better and more natural one.

Purposive View. (McDougall)

Attention is the conative disposition stirred up by the thinking of some object. The more strongly we desire to see, hear, or understand, the more attentive we are. Conversely, we are less attentive, the less strongly we strive to know some object.

QUESTIONS

1. Give three different definitions of attention.
2. Name the three classes of attention and give an example of each type.

3. Discuss Woodworth's laws of attention.
4. Describe the motor aspects of attention.
5. *Mark the following true or false:*

(a) Attention does not shift if the stimuli remain constant.

(b) We should do everything attentively.

(c) The Gestalt view states that attention is a difference in clearness.

(d) Voluntary attention is chiefly dependent on the native factors of advantage in the stimulus.

(e) Attention has a biological utility for the organism.

(f) The behavioristic view of attention is very similar to McDougall's view.

CHAPTER VIII

INTELLIGENCE AND LANGUAGE ACQUISITION

LANGUAGE ACQUISITION (ALLPORT)

Gesture—Head-Shaking

Avoidance or Withdrawal Stage. At first, the baby turns his head away to prevent undesirable substances which touch his lips from entering his mouth.

Conditioned Stage. Later, only the sight of the undesirable object by conditioned response calls forth the same reaction. This response is made before the food comes to the child's lips and is used as a sign to control the social environment.

Expressive Stage. The final stage in the head-shaking reaction is the use of the negative gesture to express a difference of opinion.

Articulate Speech

Random Articulation and Fixation of Responses. By random articulation the baby says, "da" and hears himself say it. The sound of that syllable acts as a stimulus for pronouncing the same "da." Thus, at first the saying and hearing cause the articulation. Later when the ear-vocal habit is established the hearing of the sound becomes adequate for the production

of it. In like manner the baby comes to repeat any simple sound he hears.

The Articulation of the Same Fixed Responses Called Forth by the Speech of Others. When only the sound of a word is necessary for the child to articulate that word, it may be spoken by a person other than the child. The child responds to a word not exactly duplicating that word but with the nearest approximation to it that it already has learned. The word "doll" spoken by the adult would be repeated "da" by the child.

In this stage vocalization becomes diversified, the kind of sounds that are articulated differing according to the language spoken to the child. As yet, the words have no meaning to the child.

Articulation of Fixed Responses Called Forth by Objects and Situations. A given word becomes attached to a given object. As in the previous stage, the child repeats "da" when the word "doll" is spoken. Only now the doll is shown at the time that the word is spoken. By conditioning the sight of the doll alone becomes adequate to call forth the response "da"—the child's way of saying "doll."

INTELLIGENCE

Intelligence Testing

Kinds of tests.

Language. These tests consist of questions and problems which the subject answers either orally, as in the Stanford-Binet test, or written, as in the Army Alpha.

The limitation of these tests is that they cannot be

used with the deaf, foreigners, and those having speech defects.

Performance. These tests can be given without the use of language. They require the management of concrete objects. For example, in the Form Board there are a number of blocks of different shapes which have to be fitted into appropriate holes in the board. The score is based upon the amount of time required to do this and the number of errors made.

Group. Such tests make possible the testing of large numbers of subjects at the same time. These tests may be either verbal or non-verbal.

Test construction.

1. Tests must be standardized, showing that the test scores give a normal distribution.

2. The validity of a test has to be determined by correlating it with other tests measuring the same ability.

3. The reliability of a test is established when it correlates highly with itself.

4. Tests should equalize factors of training. When a person is tested, both innate and acquired traits are measured. To obtain native factors training is equalized in either of two ways. (a) Giving technical problems that are unfamiliar to all the subjects. (b) Including elements that are fairly familiar to the whole group.

Intelligence Quotient.

The I. Q. is equal to the Mental Age, as measured by the scale of a standard test, divided by the Chronological Age.

A certain test is given to a large number of children of different ages. The average score of each age is taken as the typical performance for that age. These scores are then arranged in a scale where each age corresponds to a definite score. Thus, when an individual receives a certain score in a particular test his M.A. is immediately determined by reference to the scale of that test.

Classification and Distribution.

Dist.	I. Q.	Class
1%	0–69	Feeble-minded
5%	70–79	Borderline
14%	80–89	Backward
60%	90–109	Normal
14%	110–119	Bright
5%	120–129	Very Bright
1%	130–over	Very Superior

Uses of Intelligence Tests.

Diagnosis. Individuals are classified according to their ability so that those capable of a certain level of attainment may be grouped together for instruction or other pruposes.

Prognosis. The test scores may be used to direct an individual to the course of study or type of vocation for which he is best fitted.

Limitations of Intelligence Tests.

1. They do not test the ability to use tools.
2. They do not test the ability to manage people.
3. They are not adequate to test one's ability to solve important practical problems.

General Factors in Intelligence (Woodworth).

1. **Retentiveness**—the ability to learn and remember.
2. **Responsiveness to relationships**—applying what one has previously learned to a new situation.
3. **Persistence**—instinct of self-assertion.
4. **Submissiveness**—giving up an unsuccessful method of attack in order to try another.
5. **Curiosity**—instinct of exploration and manipulation.

Heredity of Intelligence.

1. The degree of intelligence remains fairly constant during the lifetime of an individual.
2. Mental resemblances among members of the same family are greater than among people who are not related. Twins are more alike mentally than are brothers and sisters.
3. Feeble-mindedness runs in families.
4. Special aptitudes run in families.

Nature of Intelligence. (Perrin and Klein)

Unimodal Theory.

This theory assumes that there is one kind of general intelligence. Therefore, an individual doing well in one mental activity will also qualify in other mental performances.

Spearman's two-factor theory is a modification of the unimodal theory to allow for environment and training. According to this view, a test score is due to:

1. *General factor*—general mental ability.
2. *Specific factor*—special training for the test.

To measure the G factor we must eliminate the effects of specific training by correlating dissimilar tests.

Multimodal Theory.

This theory assumes that there are various kinds of intelligence. Thus, tests measuring one kind of ability will correlate better with tests measuring the same ability than with tests measuring other abilities.

Non-Modal Theory.

This theory denies that there is any general intelligence. All acts of intelligence are specific. The correlation between different tests is due to the fact that common or identical elements are present in them.

REASONING (WOODWORTH)

Definition.

Reasoning is a mental trial and error process culminating in inference. Inference is a response to two facts which are not present to the senses, the response consisting in the perception of a third fact that is implied in the other two.

Varieties of Reasoning.

1. Solving a practical problem. A problem is a situation for which we have no ready and successful response. To solve a problem, a desire is aroused which facilitates the observation and recall of pertinent facts. These facts considered together yield the solution.

2. Rationalization or Self-Justification. This type of reasoning assigns good reasons instead of the real reasons for our behavior.

3. **Explanation.** This kind of reasoning shows how a specific fact is deduced from a general principle.

4. **Application.** This variety of reasoning applies the general principle to the searching of specific facts.

5. **Doubt.** This form of reasoning searches for facts which contradict a given statement.

6. **Verification.** This type of reasoning begins with a general proposition and tests it by specific facts.

Qualifications for a Good Reasoner.

1. A large stock of major premises, consisting of rules and principles acquired in previous experience.

2. Valid minor premises, which are the particular facts of observation.

3. The ability to draw correct conclusions from the major and minor premises.

THINKING

Dewey's View

Use of the Term.

1. Opinion or beliefs of a simple, descriptive, and unreflective nature. This includes day-dreaming, flitting impressions, trivial recollections, or "anything that goes through the mind."

2. Imaginative consideration of things or events which lie in the past or in the future. This class is restricted to things or events not directly perceived.

3. Judgments after considering both sides of a case. Such decisions are usually based upon tradition and instruction rather than upon a survey of all the evidence.

4. Reflective thinking or problem solving is the ac-

tive, persistent, and careful consideration of any belief in the light of the evidence that supports it, and the further conclusions to which it tends.

Analysis of Reflective Thinking.

1. A felt difficulty.
2. Its location and definition.
3. Suggested hypotheses or theories of solution.
4. Reasoning out the implications of the hypotheses.
5. Testing the hypothesis by reference to the facts which it attempts to explain.

Watson's View

Thinking is sub-vocal speech or processes which may be substituted for the verbal activity. These processes may be an overt bodily movement, such as the shrug of the shoulder, or the implicit movements involved in written words, or a visceral response.

Whenever the individual is thinking his whole bodily organization is working implicitly. The dominant activity may go on in: 1. The implicit verbal organization. 2. The implicit manual organization. 3. The implicit or overt visceral organization.

In the latter two cases thinking takes place without words.

QUESTIONS

1. What is the social significance of language?
2. Trace the development of articulate speech in the child.
3. Briefly describe the various kinds of intelligence tests.

4. What are the requirements for a good intelligence test?

5. Which is the better criterion for grouping pupils into homogeneous classes, the mental age or the intelligence quotient? Give reasons.

6. Discuss the uses and limitations of intelligence tests.

7. Give Woodworth's classification of the varieties of reasoning.

8. How could one test Dewey's analysis of thought experimentally?

9. Discuss critically Watson's view of thinking.

10. *Mark the following true or false:*

(a) The I. Q. is calculated by dividing the chronological age by the mental age.

(b) The mental age may be less than the chronological age.

(c) Psychology is concerned with the process of reasoning, and logic with its validity.

(d) According to Woodworth, reasoning is a trial and error process in the sphere of mental reactions.

(e) Language plays a large part in performance tests.

(f) Curiosity is a factor of intelligence.

CHAPTER IX

LEARNING

THEORIES OF LEARNING (PERRIN AND KLEIN)

Pain-Pleasure Theory

The fundamental assumption of this theory is that all living organisms seek satisfaction and avoid pain. Applied to learning, this theory states that all acts that bring pleasure to the organism are selected and fixated, while those that bring pain are eliminated.

Thorndike's Modification of the Pain-Pleasure Theory

The behavior of animals, including man, is determined by native organization, especially the original arrangement and connection of the neurones. Learning is the modification of these original neural connections and this theory attempts to account for such modification.

Selection of responses is explained by the Law of Effect, which states that the consequences of an act determine whether that act will be repeated or not. Those responses that result in satisfaction to the animal become more firmly connected with the situation, so that, when the situation recurs, the responses will be more likely to recur. Those responses that result in discomfort to the animal will have their connections

with that situation weakened, so that, when that situation recurs, the responses will be less likely to recur. The greater the satisfaction or the discomfort, the greater will be the strengthening or weakening of the bond between situation and response.

Fixation and elimination of responses are accounted for by the Law of Exercise with its two sub-laws, the Law of Use and the Law of Disuse.

Law of Use—explains fixation. A response to a situation will be more strongly connected with that situation in proportion to the number of times it has been connected with the situation, and to the average vigor and duration of the connections.

Law of Disuse—explains elimination. A response to a situation that is not repeated when the situation recurs, is weakened until it finally is eliminated.

Criticism.

1. The theory describes the facts of learning but does not explain the mechanism—why the facts are so.
2. Not all rejected acts are unpleasant and not all selected acts are pleasant.
3. This theory does not account for acts which are indifferent.
4. We can know nothing of the feelings of animals below man.
5. The theory assumes that the organism is aware of the relation between each separate act and the result of it. In fact, the organism does not know which acts bring satisfaction and which discomfort. Likewise, we make many movements during learning of which we are not aware.

Confirmation and Inhibition Theory (Hobhouse)

Animals have inherited tendencies to behave in certain ways, *e.g.,* chicks naturally peck at many things. Those native tendencies which lead to successful results, such as pecking at edible substances, are selected or confirmed. Fixation of these responses is due to repetition of them.

Elimination of responses is due to the inhibition of native tendencies that result in unsuccessful responses, such as the pecking at inedible substances. When an unsuccessful response is made, withdrawal from that object follows approach to it. Thus, both of these inconsistent reactions become attached to the same stimulus. Whenever two mutually inconsistent or antagonistic responses such as approach and withdrawal become associated with a certain stimulus, these responses inhibit each other.

This theory is more objective than Thorndike's since a response is fixated or eliminated not because it produces certain brain states, but because it becomes associated with a confirming or an inhibitory stimulus.

Criticism.

This theory does not explain why certain responses are confirmed while others are inhibited. It only states the observed facts.

Congruity Theory (Holmes)

Animals are endowed by instinct with the capacity for responding to beneficial stimuli with movements of approach, and to injurious stimuli with movements of withdrawal. Responses are selected because they are

successful or congruous, and rejected because they are unsuccessful or incongruous. Fixation is due to the repetition of those responses which arouse instinctive acts that are congruous.

Elimination of responses is explained by the inhibition of mutually inconsistent responses, just as in the theory of Hobhouse.

Criticism.

The theory does not explain why congruous acts are selected and incongruous acts rejected.

Drive or Motor-Set Theory (Woodworth)

The dynamic theory involves two factors:

1. *Drive*—why we do a certain thing.
2. *Mechanism*—how the acts of behavior are accomplished.

A stimulus arouses the mechanism towards the consummatory reaction. If this end-result cannot be accomplished at once, the mechanism acts as a drive operating other mechanisms which give preparatory reactions. The preparatory reactions which lead to the consummatory response are facilitated while those that do not are inhibited.

Selection of responses is due to the reaction tendency or bodily adjustment of the organism facilitating responses preparatory to the end-result. Elimination of responses is due to the inhibition of responses that do not bring the end-result.

Completeness of Response Theory (Peterson)

Learning consists of a complete response to a complete set of conditions. Successful responses are more com-

plete or unitary than unsuccessful ones, where there are conflicting neural and muscular processes. If a correct response is made the first time, the impulses to go into false pathways are diminished. If an incorrect response is executed at the first trial, the tendency to go in the true pathway is still active and the false response is directed into the successful response to reinforce the latter.

In a complex situation such as in learning or problem-solving, there is an interacting and overlapping of many reactions. Selection depends on the completion of the dominant response and is due to the cumulative effect of the various incomplete partial responses that lead to the end-result. Those responses which do not lead to the completeness of a response are eliminated by being directed into the successful responses and reinforcing them.

Criticism (Wiltbank).

1. Why should there be impulses to follow the correct pathway when entering a blind alley, and impulses to enter the blind alley when following a true pathway?

2. Why are the tendencies to enter the blind alley diminished when the true path is followed, while the tendency to go to the true pathway persists even when the animal begins by choosing the blind alley?

3. Why should the combination of an erroneous tendency and a correct one reinforce the correct one, instead of counteracting each other?

Frequency-Recency Theory (Watson)

This theory explains learning on the basis of two factors:

1. *Recency.* Each response in a learning situation ends with the successful movement. In the following trial, that movement is more likely to be made than the other movements because of its recency advantage.

2. *Frequency.* In the first trial, the animal is just as likely to make one response as any other. Since each complete response includes a successful movement, frequency favors the fixation of successful responses.

Criticism.

1. The fact that an animal makes one response rather than another shows that all responses are not equally possible at the start. If Watson's assumption were true, the animal would make no response at all.

2. Animals repeat errors many times while the correct movement ends the response. Thus, frequency favors wrong movements.

3. When successive trials are given a day apart, the recency factor becomes negligible.

4. The theory does not account for the elimination of wrong responses.

Intensity Theory (Carr)

Movements along the true pathway become more intense than those along the blind alley. Selection is due to the intensity of successful acts. Unsuccessful tendencies are eliminated only in the sense that the situation does not arouse them.

Criticism.

This theory does not explain learning but merely

describes the facts. Even then, elimination of responses is inadequately described.

Conditioned Reflex Theory (Smith and Guthrie)

When the animal is placed in a learning situation it makes a series of random responses. During this trial and error behavior the animal by chance makes the correct movement and attains the end-result. This movement is selected and by repetition is fixated.

Elimination of unsuccessful responses is explained by the conditioned response. In unsuccessful responses, approach is followed by avoidance. The approach stimulus is still present while the avoidance reaction is being called forth. Thus, the avoidance reaction becomes conditioned by the approach stimulus. Then the avoidance response is given as soon as the approach stimulus is received.

Gestalt Theory (Koffka and Kohler)

Learning is a total experience and cannot be explained in terms of partial activities such as integration of reflexes. An organism reacts to configurations and not to specific stimuli.

The method of investigating learning is to provide the animal with a situation in which the direct way to the goal is barred, but the indirect path is left open. The animal is required to reach the goal by way of the indirect path. Such problem is fully comprehensible to the animal. Thorndike's puzzle-box experiments are criticized because in them the animal does not see what problem it is expected to solve.

MAZE LEARNING

Animal (Watson)

To determine what receptors the white rat used in maze, learning, Watson removed the various receptors.

Vision.

1. Normal rats trained in the light to run the maze could also run it perfectly in the dark.
2. Normal rats learned the maze in the dark as readily as in the light.
3. Rats with eyes excised learned the maze as readily as normal rats.
4. Normal rats that had been trained and then had their eyes excised, ran the maze with little loss of efficiency.

These experiments show that the maze can be learned without the aid of vision.

Smell.

The olfactory bulbs were removed but the rats learned the maze in normal time. This demonstrates that the maze can be learned without smell.

Cutaneous Senses.

1. The vibrissae were removed without affecting the performance of the trained or the untrained animals.
2. Experiments with cooled and heated copper plates showed that differences in temperature do not influence the behavior of the rat in the maze.
3. Changes in air circulation had no effect on the selection of turns in the maze.

4. Local anaesthetic applied to the soles of the feet and to the snout, left the reactions unchanged.

Hearing.

The middle ear was removed but the animals learned in normal time. This operation also makes it impossible for the changing pressure of the air on the ear-drum to influence the behavior of the rat.

Taste.

The animals ate food soaked in high percentage solutions of salt and bitter. This demonstrates that the sense of taste in the rat is too crude to play any part in learning.

From these experiments Watson concluded that the white rat selected the correct turns in the maze on the basis of the kinesthetic sense.

Human (Perrin)

At first there is trial and error behavior, consisting of random responses and many errors. As the procedure is repeated, the number of errors are decreased and the true pathway is followed more consistently.

The maze is learned as a result of three elements.

1. Associating different positions of the arm with different parts of the maze.

2. Differences in kinesthetic experiences as the arm is moved along different lengths and in different directions.

3. An image of the maze pattern as suggested by the kinesthetic sensations.

THE LEARNING CURVE (WOODWORTH)

Rise of the curve—shows an increase of efficiency due to:

1. Strengthening of the connection between stimulus and response as a result of exercise.
2. Improved methods of work, such as adaptation of muscles to special movements that are required.
3. Acquisition of higher units of work. In telegraphy the beginner responds to individual letters but later responds to words and phrases as units.
4. Overlapping of reactions—while executing a certain movement preparation is made for the next one.

Plateau—a level place in the learning curve which indicates a period of little or no progress, followed by a rapid improvement. The plateau is due to: 1. Fatigue. 2. Lack of attention. 3. Loss of interest.

Physiological Limit—is that point beyond which there is no increase of efficiency with increased practice. Mere repetition without motivation leads to a moderate degree of skill which is far below the physiological limit.

QUESTIONS

1. Discuss critically Thorndike's theory of learning.
2. What are the limitations of Watson's frequency-recency theory of learning?
3. Describe an experiment in learning which might be used by the Gestalt psychologist?
4. How did Watson prove that the white rat learned to run the maze on the basis of its kinesthetic sense?
5. Describe fully the typical learning curve.

6. Discuss Woodworth's explanation of the learning process.

7. What do you associate with the following names? Perrin, Hobhouse, Peterson, Koffka, Holmes, Carr.

8. *Mark the following true or false:*

(a) In solving mechanical puzzles, human beings exhibit much trial and error learning.

(b) Every learning curve must have a plateau.

(c) Learning consists in modifying native reactions rather than adding entirely new ones.

(d) A plateau in the learning curve always indicates that the learner has reached his physiological limit.

(e) The law of exercise does not explain how new linkages are formed.

(f) Learning by observation is not typically human.

CHAPTER X

HABIT AND TRANSFER OF TRAINING

HABIT FORMATION

Watson's View

A **habit** is any mode of acting either explicit or implicit in character, not belonging to man's hereditary equipment. It is composed of reflexes which have been organized into a definite pattern and which function in a serial order.

Both instinct and habit are organized into patterns, the elements of which function in a definite order. In instinct the pattern and the sequence are inherited, in habit both are acquired during the life of the individual.

Motor Habits.

1. The infant makes random, spontaneous, and impulsive movements in addition to its strictly reflex behavior. These movements involve all of the muscles and occur in response to stimuli from within and from without the body.

2. Later, there is the establishment of imperfectly coordinated movements of the larger muscles.

3. Finally, there is the perfecting of the coordina-

tions already established and the establishing of coordinations of the smaller muscles. This makes possible skilled movement. With the fixation of successful coordinations there is also the elimination of useless movements.

James's View

Rules for the acquisition of a new habit or for the leaving off of an old one.

1. Launch yourself with as strong and decided an initiative as possible.

2. Never allow an exception to occur until the new habit is securely rooted in your life. This means that where possible the abrupt acquisition of a new habit is better than "tapering-off" from an old one.

3. Seize the very first opportunity to act on every resolution that you make. Every emotional prompting that you experience in the direction of the habit that you aspire to gain should be given motor expression.

4. Keep the faculty of effort alive by a little gratuitous exercise every day.

Value of Habit

1. It enables us to perform an act with greater speed and accuracy.

2. A practiced act is executed with a smaller expenditure of energy than an unpracticed one. This results in a lessened degree of fatigue.

3. It allows attention to be directed to other things.

TRANSFER OF TRAINING (PYLE)

Definition.

Transfer of training is the carrying over of the effects of training in one situation to other situations. If learning in the second situation is facilitated the transfer is positive, if inhibited the transfer is negative.

What Is Transferred

Identical Elements.

In habit-formation. The mastery of any process will facilitate the mastery of any other process in which the first mastered is a constituent part. Multiplication is acquired more easily if addition is mastered first.

In acquiring knowledge. Acquiring one bit of knowledge facilitates the acquisition of other related knowledge. A mastery of Latin aids in the study of French because of common elements in their vocabularies.

Methods of Attack. In mastering any study one learns certain modes of attack. The method of orientation and the point of view may be carried into other fields of study. Thus, a scientist learns to look for cause and effect, and the mathematician for quantitative results.

Ideals and Attitudes. Ideals and attitudes of accuracy, thoroughness, intellectual honesty, and perseverance may be carried into new experiences.

Confidence. Successful mastery of one problem gives confidence in attacking similar problems. This enables one to exert all of his energy and leads to success.

Attention. What one attends to and how he attends to it may be carried from one situation to another.

CROSS EDUCATION (BILATERAL TRANSFER)

Definition.

Cross education is bilateral transfer. When a habit is established which utilizes any particular organ of the body, the bilaterally symmetrical organ shares in the training. For example, exercise of the right hand improves the performance of the left hand also.

Method of Measurement.

1. The initial performance of the right hand and of the left hand is measured by some test.

2. The right hand is then practiced until it has attained a high degree of skill in that function.

3. Then the left hand is retested.

4. The difference between the initial score and the final score for the left hand gives the amount of improvement.

QUESTIONS

1. What is the importance of habit to organized society?
2. Trace the development of motor habits in the child.
3. Is it logical to consider all behavior either as inherited or as acquired?
4. What is the relation between James's discussion of habit and the laws of exercise and of effect?
5. Outline an experiment which would test the effect of studying geometry on general reasoning ability.
6. How would a thorough course in chemistry aid one in the study of psychology?

7. Is it wise for a lawyer to spend a long time studying logic, since logic deals with the principles of correct thinking?

8. According to Pyle, what factors of one situation can be carried over to other situations?

9. Discuss Watson's view of habit and its relation to instinct.

10. *Mark the following true or false:*

(a) Habits which prove useful to parents tend to become instinctive in the children.

(b) Transfer of training does not mean the same as formal discipline.

(c) The child learns to coordinate its smaller muscles before it begins to use its larger muscles.

(d) James says that it is best to acquire a new habit gradually.

(e) Cross education may be classified under transfer of training.

CHAPTER XI

MEMORY AND ASSOCIATION

There are four aspects of Memory: 1. Memorizing. 2. Retention. 3. Recall. 4. Recognition.

Memorizing

Definition.

Memorizing is the original reception of the facts to be learned. In terms of the nervous system, it is the formation of connections between neurones.

Kinds.

Rote—the mechanical repetition of a performance over and over, such as a list of nonsense syllables.

Logical—memorizing meaningful material such as a passage of prose.

Economy. (Those methods which give maximum results for a given time of practice.)

1. Finding relationships and significant facts: (a) Grouping of the material into familiar combinations and rhythmical groups. (b) Observation of similarities and contrasts between individual items or between groups. (c) Meanings are found in the material or are read into it.

2. Recitation. The learner recites to himself and

refers to the lesson only when he is unable to continue. This method has four advantages:

(a) It stimulates study at a high level since the material is to be recalled at once.

(b) It shows what part of the lesson has been learned, adding the stimulation of increasing success.

(c) It demonstrates what sections have not been learned, so that extra attention can be given those parts.

(d) It requires the same kind of response in learning as will later be used in the test.

3. Spaced Repetition. Repeating a lesson at intervals is more economical than learning it at one sitting. What the length of the interval should be depends upon the nature of the material to be learned.

4. Whole vs. Part Learning.

(a) Emotional factors, such as interest and confidence, favor part learning and unspaced repetition.

(b) Recency value is on the side of part learning and unspaced repetition.

(c) The factors of meaning and relationships strongly favor whole learning.

(d) The factor of permanency is on the side of spaced learning.

Retention

Retention is a resting state in which a learned reaction remains until the stimulus arrives that can arouse it again. In terms of the nervous system, it is the persistence of neural connections.

Factors Determining the Amount Retained.

1. Individual differences—the amount retained differs for individuals.

2. Degree of learning—material that is better learned is better retained.

3. Distribution of learning time—spaced repetition gives more permanent retention.

4. Quantity of material learned—longer lists require a greater number of repetitions for learning but they are better retained.

5. Kind of material used—rote material is forgotten first, then meaningful material, and finally motor habits.

Economy.

Retention being a passive state, very little can be done to improve it directly. However, memorizing should be improved since the same principles of economy hold good also for retention.

Recall

Definition.

Recall is a learned response to a stimulus.

What Is Recalled.

1. Movements previously learned.
2. Facts that have been memorized.
3. Tendencies to reaction.
4. Images—recall of sensory experiences.
5. Free association—one idea calls up another.
6. Controlled association—intentional recall where words, phrases, and numbers call up meanings and numbers previously connected with them.
7. Thinking—involves the recall of past experiences and their application to present problems.

Difficulties of Recall.

1. Emotional—fear or self-consciousness interferes with the recall of a well-practiced response.

2. Distraction—interferes with recall by preventing the stimulus from acting to its full extent.

Helps to Recall.

1. Give the stimulus a chance by trying to recall all the circumstances connected with it.

2. Drop the matter and return to it again when the interference has ceased to act.

Recognition

Recognition is the identification of a stimulus that has been seen before. In terms of stimulus-response, to recognize an object is to respond to it as we responded before.

WATSON'S VIEW

Memory is a general term to express the fact that after a period of no practice in certain habits—explicit bodily habits and explicit and implicit word habits—the function is not lost but is retained as a part of the individual's organization although it may through disuse have suffered greater or less impairment.

Inhibitions and Defects of Memory

Inhibitions.

Associative. The attachment of two incompatible responses to a single stimulus results in their mutual inhibition.

Retroactive. Learning a second series of syllables

immediately after the first decreases the likelihood of recalling the first.

Reproductive. When two associations are made with the same syllable, they mutually interfere in recall.

Defects

Rearrangement. Facts are recalled in a different order from that in which they originally occurred.

Forgetting. Certain facts can not be recalled at all.

Substitution. Facts which never occurred will be inserted in place of those which actually did happen.

Disorders of Memory

Memorizing. The inability to form new associations due to:

1. *Rapid shifting of attention* from one object to another, characteristic of certain forms of insanity.
2. *Old age*—lack of the plasticity of the brain.
3. *Shock*—events following a shock are not fixated.

Retention. The destroying of associations already formed due to general degeneration of the brain or to local brain injuries.

1. *Aphasia*—the loss of ability to speak.
2. *Motor aphasia*—word habits and phrase habits are lost but not the power of vocalization.
3. *Sensory or Auditory aphasia*—the loss of ability to understand words that are heard.
4. *Verbal amnesia*—the loss of ability to find words to express a given meaning although the ability to speak words is unimpaired.
5. *Visual aphasia (Alexia)*—the inability to read or understand words although vision is unimpaired.
6. *Agraphia*—the loss of ability to write.

7. *Apraxia*—the loss of acquired motor skill.

Recall. The associations are retained but are prevented from acting as a result of:

1. *Shock*—experiences previous to the shock are forgotten.

2. *Hysteria*—patients cannot recall certain events except in periods of "attack."

3. *Alternating personality* — the subject alternates between two "personalities." He does not recall in one personality what had happened in the other but remembers what had transpired previously in the same personality.

Recognition.

1. *Feeling of strangeness*—feeling of unfamiliarity with well-known persons and surroundings.

2. *False recognition* (*Paramnesia*)—scenes and events which are new seem to have been previously experienced.

Methods of Measuring Memory. (Whipple)

Memory Span Method. The memory span is the greatest number of units that can be recited correctly immediately after one presentation. The subject is presented a series of lists which increase in the number of units they contain. The longest list reproduced correctly is the measure of the memory span.

Method of Retained Members. The quantity of material presented is too great to be learned in the time allowed. The amount reproduced is the score.

Learning Method. Measures the time or the number of repetitions required to recite a lesson once without error, immediately after studying it.

Prompting Method. The subject attempts to reproduce a series before it is fully learned and he is prompted at each hesitation or error. The score is the number of promptings required for complete learning, the best learner having the lowest score.

Saving Method or Relearning. A list of syllables is learned and after a given interval is relearned. The difference in the time or number of repetitions necessary for learning and for relearning represents the "saving" or amount retained.

Method of Paired Associates. A list consisting of pairs of syllables which are to be associated together is presented. Then only the first syllable of the pair is presented and the subject is required to respond with the word that was associated with it on the first list. The score is the number of correct responses.

Recognition Method. A number of units are presented to the subject. For the test, these units are again presented along with others which were not in the original series. The score is the number of correct responses.

Reconstruction Method. The stimuli are presented to the subject in a certain order of arrangement. Then the same stimuli are presented in a random order and the subject is required to reconstruct the original arrangement. The score is the number of repetitions with corrections to complete the task.

ASSOCIATION

Laws of Association.

Law of Exercise. When a given stimulus arouses a certain response the linkage between that stimulus and the response is strengthened by the exercise.

1. *Law of frequency.* The more frequently a connection has been exercised, the stronger does that connection become. In terms of the nervous system, neurones that are used have lowered synaptic resistances and thus establish preferential pathways in the nervous system.

2. *Law of recency.* The more recent the exercise the stronger the connection between the stimulus and the response. In terms of the nervous system, neurones which have been stimulated most recently have lower synaptic resistances than other neurones.

3. *Law of intensity.* Vigorous exercise strengthens a reaction more than weak exercise.

Law of Effect. The linkage of a response to a stimulus is strengthened when the response is successful and is weakened when the response is a failure.

CRITICISM OF IDEATIONAL ASSOCIATION (PERRIN AND KLEIN)

A. This view cannot be used to explain animal behavior, since introspection is required to determine the specific association of ideas. To attribute ideas to animals violates the law or parsimony, which states that that theory is best which makes the fewest assumptions to cover the facts.

B. The theory assumes that ideas can influence bodily functions. This assumption is based on the unproved hypothesis that mental states can affect bodily conditions.

C. This principle cannot be verified experimentally in those branches of psychology where introspection can not be used.

D. This explanation does not account for experiences which have no ideas associated with it—fearing something and not knowing why.

QUESTIONS

1. Recall some advertisements that you have seen and try to explain why you remember them.
2. What can one do to improve his memory?
3. Why do we forget?
4. What errors of memory should a lawyer seek in the testimony of a witness?
5. What are the advantages of using nonsense syllables in memory experiments? Who first used them?
6. Describe five methods of measuring memory.
7. What are the main disorders of memory?
8. Discuss critically the laws of association.
9. Define: retroactive inhibition, spaced repetition, rote memory, aphasia, retention.
10. *Mark the following true or false:*

(a) Recognition is easier than recall.

(b) Retention is the memory process which is easiest to improve.

(c) In learning a very long poem it is better to divide it into parts than to attempt to learn it as a whole.

(d) Memorizing and the formation of motor habits are essentially different psychologically.

(e) Both recognition and recall are learned reactions.

(f) Recency value favors part learning.

CHAPTER XII

PERCEPTION

PERCEPTION VS. SENSATION

1. Sensation is the first conscious response aroused by a stimulus. Perception follows sensation and attaches meaning to the sensation.

2. Sensation is the awareness of a quality, such as a color or a sound. Perception is the awareness of an object.

3. Sensation is the response of the sensory areas in the cortex that first receive the nerve current from the organ stimulated. Perception is the response of the areas in the cortex adjacent to the sensory areas.

4. Sensation is native. Perception is acquired by experience.

SPACE PERCEPTION

Space is perceived by four senses.

Cutaneous.

Position. An object in contact with the skin can be located fairly accurately by the subject. The degree of accuracy varies with different parts of the body.

Extent—Spatial or Two-point Threshold. The spatial threshould is the smallest distance between two points that are perceived as two. If the points are brought any closer together they are perceived as one. The cutaneous spatial threshold varies with different parts of the skin.

Vision.

Location and Extent—are most accurately determined by vision.

Depth or Distance—Third dimension due to:

1. Disparity of retinal images.—The two eyes view the same object from different angles. This results in two retinal images which do not coincide. The difference between these images gives the impression of depth.

2. Size of retinal image.—The nearer an object is to the observer the larger is the image of that object.

3. Clearness of outline and detail.—The nearer an object is the more distinct and detailed it is.

4. Color.—The color of nearer objects is more vivid and of a different quality since colors seem to fade with distance.

5. Shadows.—The shadows of near objects are more distinct and of a different shape than more distant objects.

6. Superposition.—Distant objects are partly cut off by nearer objects in the same line of vision.

7. Eye accommodation.—To focus near objects the lens becomes thicker and the eyes are converged. When the object is distant the lens becomes thinner and the eyes are parallel to each other.

Auditory.

Direction—Sounds can be distinguished as coming from the right or from the left side. When sounds come from the front, the back, above, or below, the subject cannot distinguish the direction.

Distance—is judged from the intensity of the sound.

Kinesthetic.

When this sense is stimulated the cutaneous sense is stimulated along with it. Together they give spatial facts about movements and objects that are handled.

Illusions—False Perceptions

Due to peculiarities of sense organs.

The stimulus is distorted by the sense organ.

1. *After-images*—due to retinal processes.
2. *Color contrast*—due to the mutual effect of adjacent surfaces.
3. *Double vision*—the eyes are not properly focused on the object seen.
4. *Horizontal-vertical*—Vertical lines appear longer than horizontal lines of equal length, due to a peculiarity of the retina.

Due to mental set.

Mental set predisposes us to make responses that are in line with it. For example, when we are expecting someone to arrive any slight noise is taken for a footstep.

Response-by-Analogy Type.

If a present stimulus has some element in common with a stimulus that has in the past aroused a certain perception, we are likely to make the same response to the present stimulus as we had to the other.

1. *Proofreader's illusion.*
2. *Aristotle's illusion.*—If two fingers are crossed and

an object touches the crossed part, it seems that two objects are touching.

3. *Motion pictures.*—Are a series of snap-shots in rapid succession.

Due to imperfect isolation of the fact to be perceived.

Size-weight illusion.—Two boxes, one several times as large as the other, are made to weigh the same. When they are lifted the smaller box appears heavier.

Muller-Lyer illusion.—Two equal lines appear as unequal due to the fact that angles opening in opposite directions are drawn at their extremities. There have been three main theories to explain this illusion.

1. Eye movements.—This story assumes that the eye measures the length of a line by moving over it; the greater the eye movement, the greater appears the magnitude of the line. In the Muller-Lyer figure where the sides of the angle are turned inward, the movement of the eyes is impeded and the horizontal line appears smaller than it really is. In the other figure, the eyes are led beyond the length of the line to the end of the figure and hence the horizontal line seems longer than it is.

This theory has been disproved experimentally. Illusion figures were exposed by means of a tachistoscope for so short a time that eye movements were not possible, yet the illusion effect was greater than in prolonged exposure. Likewise, eye movements were photographed and shown to be too inconsistent to explain the illusion.

2. Empathy theory—(Lipps). According to this view the observer projects himself into the object being ob-

served. In the illusion figure where the sides of the angle are turned inward, the area included by the figure is limited. The observer feels crowded and judges the horizontal as shorter than it really is. In the other figure the impresison is one of expansion and the subject reports the line as greater than it is.

3. Confusion theory.—This theory assumes that our judgment of a part of a figure is influenced by the size of the whole figure. Illusion figures are so constructed as to make difficult the isolation of the particular part of the figure which is to judged.

The theory is supported by three lines of evidence:

(a) The illusion is markedly reduced if the horizontal line is set off from the rest of the figure by being presented in a different color.

(b) The illusion is greater in momentary than in prolonged exposure. In the first case there is time only for the perception of the total figure and not of the individual parts.

(c) Savages are less subject to the illusion. Since the figure has little meaning to them, they are less influenced by the figure as a whole and attend more exclusively to the horizontal line.

Weber's Law

In the same kind of perception equal relative differences are equally perceptible. For example, a person can just perceive the difference between weights of 100 and 110 grams. The difference between the weights is 10 grams, the second being $\frac{1}{10}$ heavier than the first. This relation also holds good for other weights. If one weight is 200 grams the second weight

must be $\frac{1}{10}$ greater or 220 grams, before the difference between the weights is perceptible.

The law can also be stated: the least perceptible difference in each kind of perception, is a constant fraction of the stimulus. This constant fraction is known as **Weber's Constant** and varies for different kinds of perception.

Weber's Law holds good only for the middle range but fails in the upper and lower limits of perception.

Thresholds

Differential.

The differential threshold is the smallest difference between two stimuli which can be perceived.

Two stimuli, a variable and a standard, are made equal and then the variable is increased by small increments until the subject finds it just perceptibly greater than the standard. That determination is recorded. Then the variable stimulus is made obviously the greater and is decreased by regular increments until the subject judges both stimuli as equal. That value is recorded. The average of these two determinations gives the differential threshold.

Absolute.

The absolute threshold represents the limit of sensibility.

We began with a stimulus which yields a clearly noticeable sensation and diminish that stimulus by small gradations until a point is reached at which a sensation is no longer produced. That reading is noted. Then we start with a stimulus that produces no sensation and gradually increase that stimulus until it gives a

just noticeable sensation. That determination is recorded. The average of these two values gives the absolute threshold.

QUESTIONS

1. Distinguish between sensation and perception.
2. How do we see objects upright when the images on the retina are inverted?
3. What are the main causes of illusion?
4. State and illustrate Weber's Law.
5. Discuss two theories that attempt to explain the Muller-Lyer illusion.
6. Describe an experiment by which one could determine the highest audible tone.
7. What factors determine the apparent depth or distance of an object?
8. How could one prove experimentally that animals see illusions?
9. Explain: Response-by-analogy, size-weight illusion, two-point threshold, mental set, differential threshold.
10. *Mark the following true or false:*

(a) The concept of trial and error is not applicable to perception.

(b) Binocular perception is more efficient than monocular.

(c) Weber's Law states that absolute differences are equally perceptible.

(d) Perception may change while sensation remains the same.

(e) Vertical lines appear longer than horizontal lines of equal length.

CHAPTER XIII

IMAGINATION

Definition (Woodworth)

Imagination is mental manipulation in which thoughts and meanings are recalled and rearranged. In terms of stimulus-response, the stimuli are combinations of facts that have been brought together from various sources and the response to this combination of stimuli is invention.

Invention and imagination mean the same process only invention looks to the end-result while imagination is concerned with the process. The process of imagination may be free as in play, or controlled as in planning.

Beginnings of Imagination.

The child's manipulation begins with the random handling of objects and develops in four directions.

Manual skill.—The child learns to manage the things he plays with.

Constructiveness.—In this line of development taking things apart and putting them together are typical activities. This type of manipulation calls for ways of arrangement and rearrangement rather than for manual skill.

Make-believe.—The actual things themselves make

little differenec to the child. He manipulates them according to the meanings that he attaches to them. For example, a broomstick is a "horse" to run to the "fire" with and the next minute becomes a "hose" to extinguish the "flames."

Story-telling.—In this type of manipulation the child fabricates stories about people and things. Due to personal and environmental limitations the child cannot gratify many of his impulses and therefore substitutes imaginary for actual conditions. Here manipulation is mental while in make-believe there is actual manipulation of things.

Play

Play Stimuli

1. Little models of articles used by adults—tools and dishes.
2. Noise-makers—drums, bells, and whistles.
3. Things that increase the speed of locomotion or that moves you in unusual ways—skates or swing.
4. Things that increase the radius of action—bow and arrow.
5. Things that resist the force of gravity—kites and balloons.
6. Things that move in surprising ways or that are automatic—mechanical toys.
7. Things that can be readjusted—water taps which turn on and off.
8. Plastic materials—paper to tear or fold.
9. Playmates.

Play Responses and Motives.

1. **Fighting.**—In games like wrestling and boxing the

instinct of fighting is satisfied although no real anger is aroused.

2. Pursuit and Escape.—The instinct of hunting and the joy of escape are included in games like football and chess.

3. Dancing.—Gratifies the sex instinct.

4. Motor activities.—Common to almost all games and sports.

5. Social activity.—Taps the gregarious instinct.

6. Fear and Escape.—The instinct of fear is aroused but is quickly followed by escape. Worry is also of this type of reaction.

7. The self-assertive instinct is gratified by: (a) competition between individuals or groups. (b) Managing the game or toy. (c) Doing something well, either really or in make-believe. (d) Empathy—The observer projects himself into the thing observed and in doing so gets the same satisfaction watching that object as he would being that object. Thus in flying a kite the observer feels the freedom from the force of gravity and hence a sense of power and mastery.

Day Dreams

Conquering hero type. The dreamer pictures himself, or someone closely identified with himself, as the hero of an important situation. He imagines that he is a very extraordinary person whose superlative achievement wins social approval and admiration. Such dreams satisfy the self-assertive instinct and other motives, being a substitute reaction taking the place of actual performance.

Suffering hero type. The dreamer magnifies an ail-

ment or an injury done to him in order to enhance his importance. Sometimes he imagines himself a martyr misunderstood and sometimes as an alarming sinner. The motive always is to appear in the center of the stage and to attract attention. In this type of daydream the dreamer takes refuge in imagination in order to avoid the actual and disagreeable reality.

Dreams

Freud's Theory. According to Freud all dreams are the fulfilments of repressed sexual desires. Due to social pressure, sex wishes are forced into the Unconscious. There they remain active and come into consciousness whenever possible. During sleep the individual is morally off-guard and his repressed wishes appear in dreams. Even then the wish cannot always pass the Censor and must take on a disguised form before it can appear in consciousness. This distortion of the dreamer's actual wishes requires that the dream be interpreted and analyzed before its real significance can be determined.

Freud's Dream Analysis.

There are two parts to a dream:

1. *Latent content*—the fundamental thoughts of the dream as they existed in the Unconscious before they were distorted by the Censor. The latent content can be reconstructed by giving the subject a free association test and detecting complexes by means of the psychoanalytical technique.

2. *Manifest content* — the impressions which the dreamer recalls on waking. Only a fragmentary portion

of the actual dream can be recalled which makes it appear incoherent and absurd.

The transformation of the latent into the manifest content of the dream is due to four processes.

1. *Condensation*—Any single item in the manifest content of the dream may be composed of a fusion of many elements in the latent content. For example, a figure in a dream may be built up of various traits each of which belongs to a different personality. This fusion of elements accounts for the fragmentary nature of recalled dreams.

2. *Displacement*—is the transfer of an emotion from the significant ideas to which it was originally attached, to some unimportant idea which was associated with the significant ideas in the Unconscious. Thus, what seems to be an important element in the manifest content because of its emotional accompaniment is really a substitute or a symbol for the actual item. This mechanism accounts for the absurd and incoherent nature of the dream.

3. *Dramatization*—is the translation of the latent content of the dream into visual images. Abstract thoughts are expressed in concrete pictures, in which the dreamer is the principal character.

4. *Secondary elaboration*—is the unifying of the disconnected pictures into a coherent story. This further distorts the latent content in two ways: (a) the elements are rearranged in a misleading order. (b) additional material not in the original dream is included.

Criticism of Freud's Theory.

1. There is no reason to assume that all dreams are deeply motivated. Dreams consist rather of free associations where one thought brings up another.

2. The Unconscious, which is a fundamental part of the theory, is only inferred and cannot be verified. All wishes are not unconscious although they may be vague and unanalyzed.

3. The Libido or sex motive is greatly exaggerated. There are other factors influencing behavior such as self-assertion.

4. Dream interpretations are forced. In analysis a dream means either what it represents or it may mean just the opposite, or only a part of the dream is significant. Such interpretation apparently explains all dreams but actually explains none. Likewise, sex is always found in dreams because the psychoanalyst just reads it into the facts.

QUESTIONS

1. Discuss two types of day dreaming. Illustrate with cases that you have observed.
2. What are the relations between memory, imagination, and reasoning?
3. Describe the development of imagination in the child.
4. Critically discuss Freud's theory of dreams.
5. Summarize Woodworth's discussion of play.
6. *Mark the following true or false:*

(a) We always picture a complete act in imagination before executing it.

(b) We like to be frightened because of the pleasure of escape.

(c) The pleasure of dancing depends entirely on the sex instinct.

(d) Revery is a form of imagination.

(e) In a large measure the course of a dream is determined by association.

(f) Imagination is closely related to play.

(g) Woodworth believes that sex is the most important motive in dreams.

(h) The psychoanalyst tries to repress the unpleasant thoughts of his patient.

CHAPTER XIV

WILL AND PERSONALITY

WILL

Types of Action

Involuntary.

1. *Reflexes*—occur without awareness either before or after the reaction. They are executed without any conscious end.

2. *Practiced Acts*—Through repetition an act becomes automatic and requires little if any attention.

Involuntary actions may be either sensorimotor, where the response is aroused by a sensory stimulus, or ideomotor, in which case the response is aroused by a thought or an idea.

Impulsive.

This type of action includes coughing and sneezing which strive toward desired relief. These reactions aim at an immediate end.

Voluntary.

Acts of this type are first planned and then executed. This form of behavior is highly conscious and aims at an ulterior end.

Development of Voluntary Control

At first the child's actions are impulsive and random. During this activity one of these chance movements is found to give a satisfying effect. Through a trial and error process the child eventually learns to repeat that movement at will. Then by repetition the act becomes mechanical and involuntary. Thus, a movement is impulsive at first, then becomes subject to voluntary control, and finally through repetition becomes involuntary.

Conflict

Conflict is due to the action of two incompatible tendencies which results in their mutual inhibition. It may be either of two types.

Hesitation—due to a positive and a negative tendency acting at the same time. The decision is in favor of the stronger tendency.

Vacillation—due to the arousal of two positive tendencies which are inconsistent, so that only one of them can be made.

Decision

When there is a conflict of desires one of them is chosen. Decision, then, is a response to an internal conflict. A choice is made in one of four ways.

Deliberation.—Both alternatives are carefully considered and the one that seems best is followed.

Momentary.—Two alternatives are considered in turn for a time until at some moment one becomes strong enough to be chosen.

Toss-up.—When no decision can be reasoned an arbitrary one is made.

Passive.—After a time, although the alternatives remain unchanged, a decision is formed without the individual knowing why.

Rejected Motives

When one of two alternatives is chosen the other is of course rejected. These rejected motives may be handled in six ways:

Forgotten.—Insignificant desires are lapsed into an inactive state.

Deferred.—Motives are allowed to remain dormant with a view to gratification at some future time.

Disguised.—Some motives are gratified under circumstances which hide the actual meaning of these motives.

Sublimated.—Rejected desires are satisfied through other channels, i.e., substitute gratification.

Defence mechanisms.—When these motives tend to recur the individual rationalizes his decision.

Coordination.—The rejected motives are combined with other tendencies which are socially accepted.

Securing Action

Definite purpose.—There should be an immediate goal which the individual is interested in reaching.

Knowledge of results.—The awareness of progress in an activity motivates one to greater achievements.

Self-assertion.—The spur of rivalry and competition produces greater effort and improved results.

Social motives.—Other incentives, like economic and sex motives, should be added for greater stimulation.

Initiative.—This factor is a combination of imagination and will. Imagination designs what shall be done and will puts that plan into action.

Hypnosis

Hypnosis is a passive state of increased suggestibility in which the attention of the subject is focussed upon the experimenter. During hypnosis the subject believes everything that the hynotizer tells him and does almost everything that the latter commands. Two facts are especially significant. The subject during hypnosis recalls facts that he cannot in a waking state. Suggestions given during hypnosis can be made to take effect after waking.

PERSONALITY

Definition

Personality is the sum total of an individual's tendencies to reaction both native and acquired. Each tendency is a trait and the unity of a personality is due to the integrating function of the nervous system.

Factors

Physique. This factor includes all of the physical characteristics such as size, weight, proportions of the body, and complexion. Defects of physique are often adjusted by compensatory behavior.

Temperament or Disposition. Feeling and emotion are the chief constituents of this factor. Emotions are controlled by the endocrine glands so that differences in gland secretions result in differences of temperament.

Instincts. Instinctive tendencies influence behavior in particular lines and in general social adjustment. Since these instincts differ in strength for different individuals they tend to produce various kinds of personality.

Intelligence. This factor of personality including such general traits as learning ability, imagination, and reasoning, is of special importance in social adaptability. Special abilities in particular lines such as in mathematics or painting lead to unique expressions of behavior.

Types

Ancient classification.

1. Sanguine or cheerful—results from surplus of blood.
2. Choleric or easily provoked—due to excess of bile.
3. Phlegmatic or calm—caused by surplus of phlegm.
4. Melancholic or depressed—due to excess of spleen.

Criticism.

1. Individuals do not fall into separate groups, each group being characterized by a given trait. According to the law of normal distribution, individuals vary continuously, with reference to any single trait, from one extreme to the other, the largest number being clustered midway.

2. Personality comprises a large number of traits and can not be classified on the basis of any one characteristic.

Dissociation

Multiple personality.

The same individual may manifest different personalities in turn. He passes from one personality to aonther, his behavior differing for each state. The main personality does not usually remember what has been done in the secondary personality, but in the secondary state he can recall what had transpired in the first.

Dual personality or Co-consciousness.

Dr. Morton Prince's theory is that in dissociation, the primary and secondary personalities coexist. The two parts of the individual are functioning consciously at the same time.

Kempf's Theory of Personality

Personality is due chiefly to the functions of the autonomic nervous system. That system controls pleasantness and unpleasantness which are the factors of motivation. Unpleasantness is due to the states of tension of a visceral muscle. Pleasantness results when the muscle returns to a normal state of tension. The nerve impulses caused by the visceral condition discharge into the cerebro-spinal nervous system. Thus, the behavior of organisms is motivated by the autonomic nervous system and the cerebro-spinal system adjusts the organism in the environment according to those drives.

QUESTIONS

1. Are the terms Will and Personality strictly scientific?

2. Describe the three types of action.

3. Define decision and give four ways in which it is reached.

4. Trace the genetic development of voluntary control.

5. Discuss the four main factors of personality.

6. State Kempf's theory of personality.

7. Explain why people cannot be logically classified into personality types.

8. *Mark the following true or false:*

(a) A sense or inferiority is apt to affect the personality unfavorably.

(b) Personality is independent of physical characteristics.

(c) Simple reflexes are involuntary.

(d) A person may possess two distinct personalities.

(e) Hypnosis decreases the suggestibility of the subject.

(f) Hesitation is due to the arousal of two positive tendencies which are inconsistent.

(g) Suggestions given during hypnosis can be made to take effect after waking.

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